ELECTRICAL REVIEW

AN ILLUSTRATED WEEKLY JOURNAL OF SCIENTIFIC AND ELECTRICAL PROGRESS.

VOL. 32. No. 23. WEEKLY. NEW YORK, WEDNESDAY, JUNE 8, 1898. $3 PER ANNUM. SINGLE COPIES, 10 CENTS.

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Entered at the Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

When the enthusiastic dynamo salesman had said all that he was able to to clinch the bargain, he added by way of final indorsement, "And if you don't find this machine all and more than we represent, I will return here and eat it.' Three weeks after a letter containing the following was received by the company for whom the salesman had acted: "Please have Mr. ——— call and eat the dynamo according to contract."

Como, the birthplace of Alessandro Volta, is about to celebrate the centenary of the invention of the voltaic cell.

An experiment concluded recently at Marysville, Cal., by Dr. F. A. C. Perrine, of Leland Stanford University, utilizing the electrical power line of the Yuba Power Company, from its power-house to Brown's Valley, a distance of 10 miles, demonstrated that 36,000 volts may be transmitted over a copper wire, using glass insulation, against 16,000, which has been the maximum in power transmission heretofore. The result of the experiment will be to effect a saving of half in the cost of wire in the construction of electrical transmission plants in the future. As it is now, the cost of wire is about half the entire cost of the plant.

In Turkey the use of electricity is said to be prohibited by an irade of the Sultan, and in accordance therewith patents for electrical inventions are refused.

A press dispatch says that Edward Blackwell, who had been missing from his home at Montpelier, Vt., for a year and a half, and had been given up for dead, returned on Decoration Day. He was manager of the Consolidated Electric Company at Montpelier, and disappeared from a hotel in Boston in September, 1896, leaving a wife and children and an aged mother in Vermont. His wife is a niece of Admiral Dewey, being a daughter of Charles Dewey, brother of the famous naval officer. Mr. Blackwell's story of his disappearance is to the effect that he experienced a lapse of sensibility, and when his reason returned he found himself on board a South American steamer. Those who had attended him said he had been very ill. On reaching Colon, Columbia, he purchased a ticket for Panama; then he went up the Pacific coast to California, where he had been ever since.

MR. SAMUEL INSULL, OF CHICAGO, PRESIDENT OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

A foreign exchange states that at a recent meeting of the Académie des Sciences M. Mascart reported that he had received the information from M. Venukoff that Professor Leïst, of Mosoow, had found a magnetic pole at Kotchetooka, a village in the government of Kursk in Russia. The magnetic needle at this point assumes a vertical position, and at a distance of 20 metres the direction of the needle changes one degree. As regards declination the point observed is indifferent, that is to say the horizontal needle remains in equilibrium in all positions. It is no rare thing to find isolated poles in Russia, nor magnetic poles in pairs, but an isolated magnetic pole in a latitude of 52 degrees North is a phenomenon not to be lightly overlooked.

The signal corps connected with Fort Sheridan took with it to the front as its equipment 10 miles of wire, 500 line supports and three wagons loaded with batteries and instruments.

IN CHICAGO.

National Electric Light Association Begins Its Twenty-First Convention With a Fair Attendance.

PRESIDENT SAMUEL INSULL WELCOMES THE DELEGATES TO THE GREAT CITY ON THE INLAND SEA AND ASSURES THEM FULL WESTERN HOSPITALITY—FIRST DAY'S PROCEEDINGS—PARTIAL LIST OF THOSE IN ATTENDANCE—CHICAGO'S NUMEROUS ELECTRICAL ESTABLISHMENTS OBJECTS OF MUCH INTEREST, AND MANY INVITATIONS TO VISIT THEM SENT TO DELEGATES—A RECEPTION.

CHICAGO, June 7, 1898.

The city of Chicago is to-day extending a cordial greeting to the apostles of the electric light. The delegates to the twenty-first convention of the National Electric Light Association have been arriving in the city for several days past and the attendance is quite representative, although not as large from the East as was hoped for. As one officer put it, "A large number of electrical people of the Atlantic coast are engaged in fighting Spaniards or furnishing supplies to the government."

There is a pronounced interest in the work of the convention, and, if the first day's proceedings are to be taken as any criterion, there will be a very full discussion on the various topics to be presented.

There are always new inventions and new ideas developed at these gatherings. There was no general exhibit of apparatus arranged for this year, although many rooms have novelties of electrical appliances.

The special train from New York, under the guidance of Mr. Baker, arrived Monday afternoon, and an air of prosperity, as well as electricity, became immediately evident at the Auditorium Hotel. These eastern delegates looked well, and reported

better times, war or no war. The trip from the East had been made in Wagner cars over the New York Central and Michigan Central railroads, and everybody had words of praise for these great transportation companies. Proprietor Southgate and general manager Ed Kennedy, of the Auditorium Hotel, took good care of every electrical visitor. This hotel is an admirable one for conventions of this kind.

The sessions of the association are being held in the banquet hall of the Auditorium, with secretary Geo. F. Porter at his desk, handling the clerical work with ease and ability. A stenographic report is being taken, and all important discussions, as well as papers, will appear in full in the ELECTRICAL REVIEW. The last session will be held Thursday afternoon, at which time new officers will be elected and the place of next meeting be decided upon.

Probably a more suitable and attractive place could not have been selected for holding the twenty-first convention of the National Electric Light Association than the magnificently appointed Auditorium, where as early as Sunday last delegates and visitors began to arrive by the score. If the number 13 be an unlucky one, it surely proved the proverbial exception in this case, for a more successful and enjoyable gathering seldom assembled than the one now 13 years old. Even the weatherman, located in the Auditorium tower, entered into the spirit of the occasion by providing a generous supply of the kind of June weather which long ago made Chicago famous as a Summer resort.

The meeting of the (Illinois) State Railway Association, which its committee arranged to have occur at the same time and place, caused quite a respectable addition to the already heavy attendance. While a number of delegates selected neighboring hotels as their headquarters, fearing lack of accommodations at the convention hotel, by far the greater part is comfortably located there.

Among the electrical names registered at the Auditorium Annex are Dr. Wm. Habirshaw, G. J. Jackson, C. B. McKinney, H. C. Stockdell, J. W. Hull, U. C. Crosby, O. U. Crosby, E. E. Wade, F. Boas, J. L. Chapman, P. A. Chisdell, G. D. Rosenthal, J. H. Livesey, Thomas Ferris, J. H. McGraw, E. E. Wood, S. Marsh Young, H. L. Shippy, J. M. Bradley, F. M. Phillips, Norman Marshall, F. S. Smith, Chas. Clark and wife, R. J. Randolph, M. E. Baird, F. E. Cabot, H. T. Edgar, W. D. Packard, J. D. Robinson, Herbert Lloyd, J. R. Williams, Charles Blizard, H. H. Brooks, J. P. McQuaide, C. A. Benton, Luther Stieringer, J. E. Pyle, Charles A. Haxamer, T. P. Kick, W. S. Mullen, C. W. Rice.

The large and elegant banquet hall is being used for the convention proper.

All Chicago houses have representatives in attendance, doing everything to make everybody feel happy and content.

The ELECTRICAL REVIEW is represented by C. E. Kammeyer, of Chicago, and Charles W. Price, of New York.

THE FIRST DAY'S PROCEEDINGS.

There was the usual delay in starting the first day's proceedings. President Insull called the convention to order shortly before noon in the banquet hall of the Auditorium Hotel, and the roll was called by Secretary Porter. There was a fair response of members.

President Insull delivered his annual address. An abstract follows:

I am in doubt whether to enlarge upon the great growth of the association since its formation in Chicago, or as a resident here to dwell at length on the marvelous growth of the city in which we meet. The officers of the association had in mind the importance of bringing before you subjects of interest to central station managers. The topics for discussion cover a wide range. It is unnecessary to occupy much time for their introduction. The importance of having standard machinery in central stations brings up the necessity for adopting standard specifications. Special apparatus causes expense and delay in obtaining duplicate parts. It is important to sell current to the greatest number of consumers at the lowest possible price and obtain reasonable profit. The selling price must be based on the cost. If the cost of production varies, it is but fair that the selling price should vary accordingly.

It seems impossible that the assumption of a municipality producing electricity as cheap, or cheaper than a private corporation, is well founded. Competition is not the true regulative force. Protection to any industry tends to reduce the cost of production. I believe in compensation for franchises, considering the same items of expense in determining the selling price. In taxing private property for public use, I believe the municipality, under proper conditions, should be obliged to pay a fair price. On the other hand, if a corporation invests money, and develops its business it is unfair for a community to engage in the same work without purchasing the existing plant. I summarize the position we should take in just two sentences: First, franchises granted to a public service corporation should secure the same degree of protection in their rights to property as is enjoyed by other investments. Second, public control of the charge for service based on the cost plus a reasonable profit eliminating the competition factor, is a proper safeguard for the interests of users, tax-payers and investors.

Mr. Calvin W. Rice, Brooklyn, N. Y., read his paper on the "Cost of the Generation and Distribution of a Unit of Electricity."

The following programme for the balance of the day was followed:

Topic, "Prices and Discounts for Electric Current and Methods of Billing Current to Customers."

Paper, Alex. Dow, Detroit, Mich., "Public Lighting with Relation to Public Ownership or Control."

Topic, "Legislative Policy as to Public Service Corporations."

The convention then adjourned, to meet at 10.30 Wednesday morning, and will follow closely the programme published in the ELECTRICAL REVIEW last week. Mr. Herbert A. Wagner's and Mr. L. A. Ferguson's papers—both important—will probably come first.

THE RECEPTION.

The reception by the electrical interests of Chicago, held at the Auditorium Hotel last night, June 6, from 8.30 to 10 o'clock, was a very pleasant affair. The visitors and ladies were all present, and the Chicago members of the electrical fraternity and ladies were out in numbers. The reception committee was active in seeing that every one was made at home, and consisted of the following named Chicago gentlemen:

C. H. Wilmerding, chairman; B. E. Sunny, J. B. Wallace, Samuel Insull, A. S. Hibbard, E. K. Comstock, F. B. Badt, J. Holt Gates, F. H. Clark, F. S. Gorton, W. H. McKinlock, J. B. O'Hara, Geo. C. Bailey, M. Coster, L. A. Ferguson, G. A. McKinlock, W. A. Kreidler, Chas. Munson, E. B. Kittle, F. W. Kohler, Martin J. Insull, J. R. Wiley, F. E. Donohoe, W. W. Low, R. B. Rawles.

THE START FROM NEW YORK.

The New York delegation started for Chicago at 1 P. M. Sunday, June 5, in the special Wagner car "Cloverdale," which was attached to the regular western express, leaving over the New York Central & Hudson River Railroad daily. Mr. W. H. Welsh, traveling passenger agent for the New York Central, was in charge of the party, which was made up as follows: C. O. Baker, Jr., master of transportation National Electric Light Association; E. A. Leslie, A. D. Page, M. E. Baird, James Ferguson, H T. Edgar, J. H. Dale, E. E. Wood, A. C. Shaw, C. J. Field, J. E. Woodbridge and Mr. and Mrs. Joseph Wetzler.

CHICAGO CONVENTION NOTES.

Quite a crowd of St. Louis electrical men are in attendance.

The Sprague Electric Company's handsome headquarters are in suite 128-30.

Manager J. R. Wiley, of the Standard Underground Cable Company, is located in parlor 134.

Mr. George T. Manson, of the Okonite Company, New York, was one of the early arrivals.

Many of the western telephone manufacturers are present, hobknobbing with their electric light brethren.

From present indications, the success of the Duluth trip of the Northwestern Electrical Association seems assured.

Secretary Geo. F. Porter arrived from New York several days in advance, and is as vigilant and active in behalf of the association as ever.

Messrs. Low and Stacey, of the Electric Appliance Company, were promptly in evidence and greeted visitors with true western hospitality.

The copies of the ELECTRICAL REVIEW of the last issue were distributed to the visitors yesterday and to-day, and were much in evidence and demand.

Mr. A. M. Young, vice-president of the association, expected to attend, but at the last moment was detained in the East, and telegraphed his regrets to President Insull.

Mr. Fred A. Gilbert, of Boston, was another of the eminent electric men who was prevented from attending by important local business requiring his attention this week.

President Samuel Insull and staff are exerting themselves to make all visitors feel at home, and Chicago hospitality generally is strongly in evidence.

Manager Chas. Wilmerding, of the Crocker-Wheeler Company, selected parlors 2 and 3 as a most suitable place to meet the many satisfied users of his company's apparatus.

The Sprague Electric Company, of New York, endeared themselves to the assembled delegates and their friends by having both hotels equipped with Lundell fans, furnishing plenty of breeze.

Mr. E. H. Johnson, general manager of the Sprague Electric Company, and Mr. C. A. Benton, general sales agent, are here renewing old-time acquaintanceship, and find many friends to greet them.

The Western Electric Company

presents its compliments to the members of the National Electric Light Association, and invites them to visit its extensive shops and offices during the convention of the association.

The Westinghouse Electric and Manufacturing Company, through its Chicago manager, Mr. Koster, spoke for parlors 104–6 at the Auditorium and secured some 15 rooms at the Annex, so that all of the company's friends were well provided for.

The Duluth boat trip arranged by the Northwestern Electrical Association, through the efforts of Messrs. J. M. Hill and Thos. R. Mercein, is attracting much attention, and promises to be well patronized. The palatial steamboat leaves on Friday.

President Geo. A. McKinlock and Secretary Chas. E. Brown, of the Central Electric Company, extended pleasant greetings and hospitalities to the electrical visitors. The new home of this company, at 260 to 274 Fifth avenue, was quite a rendezvous for electrical visitors.

The Western Electric Company thoughtfully established a reception committee in parlor 140, where all visitors received a cordial invitation to visit the company's mammoth shops on the west side, an invitation of which many delegates gladly availed themselves.

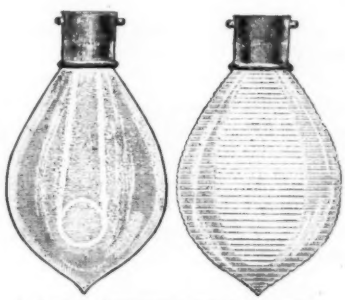
The Electric Storage Battery Company, of Philadelphia, has issued invitations to the delegates to visit its large battery installation at 139 Adams street, where, through the courtesy of the Chicago Edison Company, an inspection of this most extensive plant may be had. The Electric Light Association badge is all that is necessary for the visitor to be granted the privilege of seeing the entire plant.

The General Electric Company make no special exhibit beyond a few novelties of recent development. From the Auditorium to the storeroom of the Chicago office, where the General Electric Company keeps practically a permanent exhibit of almost every device it manufactures, is but a few steps. The magnificent plants of the Chicago Edison Company, equipped almost entirely with General Electric apparatus, serve as a General Electric Company exhibit in actual operation. The headquarters during the convention are at Room 140, Auditorium Hotel, and the company is represented by Mr. B. E. Sunny, of the Chicago office, and the following gentlemen of his staff: Messrs. F. N. Boyer, W. J. Ferris, T. P. Bailey, J. Scribner, J. W. Johnson, W. L. Arnold, Geo. J. Caldwell, J. W. Buell and W. H. Colman. In addition are Thos. Ferris, of the Milwaukee office; J. R. Livesey, of the Detroit office; P. Clisdel of the Minneapolis office; Geo. D. Rosenthal, of the St. Louis office; W. J. Hanly, of the Cincinnati office; F. M. Kimball, of the Boston office; H. R. Crowell, of the Syracuse office; A. D. Page, of the Lamp Works, Harrison, N. J., and W. S. Andrews, of the Schenectady Works.

A Spiral Incandescent Lamp Bulb.

People have complained that the light from incandescent lamps is often "wiry" or "stringy," and as a remedy the filament has been put behind translucent, not transparent, glass shades, with the loss of from one-third to one-half of the light, or behind silk or paper with the loss of even more. The difficulty of getting diffusion of light without other than quite a negligible percentage of loss has been successfully overcome by using the refraction and internal reflection from plane facets arranged rib fashion on the outer and inner surfaces of an enclosing globe. There is another possible way of doing it, says London *Lightning;* i. e., by lenticular refraction.

If a number of cylindrical lenses,



A Spiral Incandescent Lamp Bulb.

say glass rods, be arranged side by side, they convert any point viewed through them into a series of points in a line, and any line not parallel to the rods into a series of parallel lines —practically any surface of moderate size is represented by a sort of shade-in streak. Problems in cylindrical lenses are usually not much treated of in the optics books, but they are quite easy when precise results are not wanted, so we may go on to the next question, which is: What would happen if a small glass rod could be wound spirally round the bulb of a glow lamp like the string on a peg-top, only continued over the whole of the globe? It is not a merely academical problem, because the Spiral Globe Company, Limited, has done it, and holds the patent for the resulting article. It is quite easy to see that—looking at the blob end of the lamp where the little spike is; i. e., with the shank away from you —the images of the filament will be a number of concentric circles, and it is not very difficult to see that these must be of some thickness, not mere lines. As a matter of fact, the whole lamp looks full of light, and there is an increase of candle-power in this direction of about 120 per cent. If the spiral be continued up to the stalk the light will be sent up round it in a similar manner. The next easiest case is the side view in the plane of the rings (the pitch of the spiral, which, by the by, should be a helix, may of course be neglected), and this case is easy only when the filament is a single thread in the axis of the spiral, which of course it never is. Nor, as filaments vary (some are crimpled and some are curled), is it much use working out a particular one. In every event the general result is to produce a fusiform patch of light which has a very considerable resemblance to a flame. As you go downwards the flame-shaped patch broadens till it becomes the illuminated circle of the first case. In bulbs of certain shapes there are, at some angles, effects resembling those that can be studied on the top of a city man's silk hat when the sun shines. In any aspect the wiry filament is eliminated and a large light-emitting surface substituted therefor, without any appreciable loss in quantity of light.

The manner in which the spiral is applied to the bulb is interesting. It is made first out of rod glass bent on a shaper of the same form as the particular sample of glow lamp, and in its separate state is quite a springy affair. To get it on the bulb it is divided half way down, the halves are blown together when in place, and the end of the spiral is blown into the spike of the lamp. The other end is secured by an extension of the brass cap. It will be observed that there is actual junction only at the two poles, so that there is no danger of the bulb cracking under the strain of unequal heating and expansion in the spiral. An important point in the whole matter is that there seems nothing in the process to prevent the finished articles being turned out quite cheaply, which, of course, is of the essence of the business from a commercial point of view. To any one desiring to inquire further into the matter, it may be said the address of the Spiral Globe Company, Limited, is 8 Fenchurch street, London, E. C.

The Philadelphia Electrical Exposition.

The Philadelphia Electrical Exposition opened on June 1. All the exhibition space is fully occupied. President Marks anticipates a very successful exposition, and the attendance up to date would indicate that this will be the case.

Decision in the Sprague Motor Suspension Case.

Judge Shipman, of the United States Circuit Court of Appeals for the second circuit, has handed down a decree in the case of the Sprague Electric Railway and Motor Company against the Union Railway Company and Walker Company. The matter before the court was an appeal from a decree of the Circuit Court for the Southern District of New York, which adjudged that the defendants had infringed claims 2, 6 and 9 of Patent No. 324,892, dated August 25, 1895, (now owned by the General Electric Company) and issued to Frank J. Sprague for an improved electric railway motor. The defendants' motor is made in accordance with Patent No. 546,560, dated September 17, 1895, and issued to Sidney H. Short. Judge Shipman is of the belief that claim 9 was not infringed, and orders that the decree shall be modified, with costs of his court to the appellants, by limiting the infringement and the accounting to claims 2 and 6. The case is remanded to the Circuit Court, with directions to enter a modified decree in accordance with the foregoing opinion, with costs of that court. The three claims which the Circuit Court found to have been infringed are as follows:

"2. The combination of a wheeled vehicle and an electro-dynamic motor mounted upon and propelling the same, the field-magnet of said motor being sleeved upon an axle of the vehicle at one end, and supported by flexible connections from the body of the vehicle at the other end, substantially as set forth."

"6. The combination, with a wheeled vehicle, supported upon its axles by springs, of an electro-dynamic motor flexibly supported from such vehicle, and centered upon the driving axle thereof, substantially as set forth."

"9. The combination, with a wheeled vehicle, of an electro-dynamic motor centered upon the driving axle thereof at one end, a spring support for that end of the motor from the truck or body of the vehicle, and relieving axle wholly or partly of dead-weight, and a spring support for the other end of motor from the truck or body of vehicle, substantially as set forth."

The trolley traffic in Brooklyn, N. Y., on Decoration Day was the largest in the history of the various roads. It is estimated that it aggregated over 1,000,000. The receipts on the Brooklyn Heights system amounted to $27,140, and they were correspondingly large on the Nassau and the other roads.

TRAIN LIGHTING BY STORAGE BATTERY.

SEVERAL VIEWS OF THE QUESTION.

Dr. M. Buettner, of the Accumulatoren-Fabrik Aktiengesellschaft, of Berlin, Germany, recently sent the following communication to the editor of the *Railroad Gazette:*

Although well acquainted with the slow progress of electric train lighting in America, I thought that of late some advance had been made in that respect. It is my belief that in Europe, as well as in America, the system of employing storage batteries alone has a chance of being generally adopted, the system of axle lighting or that of generating the electric current by an engine and dynamo, carried in the baggage car, having proved too unreliable up to date.

Unfortunately the Electric Storage Company, of Philadelphia, which has acquired our patents for the United States, does not seem to have paid much attention to the employment of storage batteries for this object.

The electric system of car lighting extends itself every day more over all Europe, and it certainly is a queer coincidence that, at the same period when Secretary Thielen, in whose sphere of administration gas light is exclusively employed, proclaimed himself against the electric system, the General Direction of the State Railroads of Denmark resolved to introduce electric car lighting on all their lines. All the railroads on the isle of Zealand, on which Copenhagen is situated, have already electric light. A few days ago we received orders to furnish the storage batteries for lighting the trains on all the lines of the islands Falster and Fuhnen. At the same time they have resolved to establish a charging station for storage batteries at Struer in Jutland, to enable them to begin next year with the introduction of electric car lighting on all the lines in Jutland. The railroads in Switzerland will now adopt electric car lighting, following the example of the Jura-Simplon Railroad, so that in a few years all cars on the Swiss railroads will be provided with electric light.

Almost all the private railroads of Sweden and Norway have electric light, also many German and Austrian private railroads; for instance, the Dortmund-Gronau-Enscheder, the Provincial Railroad of Westphalia, the Altdamm-Colberg, the Marienburg-Mlawka, the Prignitzthal, the Mecklenburg Frederic-William, the Wittenberg-Perleberg, the Arad-Czanad, etc. The Emperor Ferdinand Northern and the Royal Hungarian Railroad introduce the system more and more. While in the beginning of 1896 in all Europe about 2,000 cars had electric light, there must be now more than 6,000.

The following letter is from Mr. Chas. Blizard, manager of the Electric Storage Battery Company's New York office:

TO THE EDITOR OF ELECTRICAL REVIEW:

Referring to the enclosed clipping from the *Railroad Gazette,* carrying an article on train lighting by Dr. Buettner, I would say that he does not seem to be well grounded in his statements. The system of axle lighting has not proved unreliable, as is evidenced by the enclosed article. As an evidence that the Electric Storage Battery Company has not entirely neglected storage-battery train lighting, I would say that chloride accumulators are very extensively used on the Intercolonial Railway, of Canada, and in the Pullman service; a small number of cars are equipped on the Illinois Central, Long Island and Union Pacific railways.

My recollection is that storage batteries for train lighting were first used in England in 1881; they were first employed here a year or two later. In Europe the runs are comparatively short and a small, light battery will meet the requirements. On the few long runs, the axle-driven dynamo is used in connection with batteries. It is a very simple matter to employ this system on English and Continental lines, as the cars are not mounted upon bogie trucks as they are in this country; that is, in the English system the axle is always at right angles to the length of the car, while in this country the axle swings underneath the car, making it a difficult matter to drive a dynamo from it. In England the dynamo is mounted in the car and is belted to the axle. The system rapidly coming into use in this country on long runs covers a dynamo mounted on the truck.

Yours very truly,
CHAS. BLIZARD.

New York, May 23.

The clipping enclosed by Mr. Blizard was cut from a railroad paper and referred to the axle-lighting system of the National Electric Car Lighting Company. The article says in part:

Three United States postal cars which, in February, were ordered to be equipped with this device, have been thoroughly provided for in this particular, and are now running regularly between Chicago and Kansas City. The cars have 24 16-candle-power lights each, making a total illuminative power of 380 candle units. These cars stand in the Santa Fe station, at Chicago, every night from 6 o'clock P. M. until 2.30 A. M., burning full light. They then run to Kansas City, using full light until daylight, and make the return trip at 6.20 P. M. of the day of their arrival at Kansas City. It will be seen that this test of the apparatus is a most exacting one, and it is timely to say that a personal inspection of these cars, at the Chicago end of the run, leaves no doubt of the fullness of their efficiency. There are now in actual use upon the Santa Fe system 54 cars thus equipped, and inquiry among the highest officials of the road has brought forth none but the most flattering criticism of the device.

GENERAL ELECTRIC MEN AT THE FRONT.

OFFICERS AND MEN OF THE COMPANY WHO ARE SERVING IN THE WAR.

Through the courtesy of Mr. W. J. Clark, manager of the General Electric Company's railway department, the ELECTRICAL REVIEW is enabled to present herewith a list, complete to May 25, of the officers and men of the General Electric Company who have "gone to the front" in the war with Spain.

Capt. Eugene Griffin, U. S. A., retired, first vice-president of the company, has, as already announced in these columns, received his commission as colonel of the First Regiment of Volunteer Engineers, and is now recruiting his men. Lieut. S. Dana Greene, U. S. N., retired, manager of the company's lighting department, received his commission as a lieutenant in the navy several weeks ago, and is now serving with that rank on the cruiser "Yankee," which is on scouting duty on the Atlantic coast, and put in to Tompkinsville, S. I., last week for coal. The "Yankee" is manned by a battalion of the New York Naval Reserves, which includes a number of electrical men, among them Russell Howland, of the ELECTRICAL REVIEW staff.

Mr. W. L. R. Emmett, of the company's engineering staff, has enlisted, but his assignment to duty is at present unknown. H. Footman, of the treasury department, is ship's writer on the cruiser "Yankee." J. M. Andrews, power and mining department, is captain of the Thirty-sixth Separate Company. G. de B. Greene, of the foreign department, is first lieutenant and R. E. Brizee, supply department, is corporal in the same company. The following are privates in the Thirty-sixth Separate Company: W. W. Miller, power and mining; Geo. C. Hollister, law; Ed Williams, patent; J. H. Moran, purchasing; Ray Rowe, construction.

On this page is a table giving the name, occupation, department, military rank and military company of 56 employés from the General Electric Company's Schenectady works who are in the military service, and are now encamped at Chickamauga Park.

It is said to be probable that a new telephone company will shortly ask the City Council of Reading, Pa., for permission to occupy the streets with its wires. Local capitalists are said to be allied with the enterprise.

Schenectady Works' Employees of the General Electric Company in Military Service Now at Chickamauga.

Name.	Occupation.	Military Rank.
COMPANY E, SECOND REGIMENT.		
H. Y. Lighthall	Mica presser.	Sergeant.
F. Hoppman	Clerk.	Corporal.
Wm. Purman	Electrician.	"
Ph. Bellin	Draughtsman.	Private.
C. F. Collett	Measurer.	"
C. E. Conlon	Machinist.	"
C. G. Crippen	Winder.	"
F. Daniels	Press hand.	"
F. L. Eisenmenger	Core winder.	"
M. S. Glennon	Machinist.	"
H. Hoppman	Machinist.	"
W. H. Larkin	Clerk.	"
C. E. Metzger	Machinist.	"
W. W. Metzger	Machinist.	"
P. Pfeufer	Vise hand.	"
P. Senghaus	Machinist.	"
F. W. Sherman	Vise hand.	"
C. J. Struble	Vise hand.	"
L. E. Walker	Machinist.	"
F. Craig	Draughtsman.	"
Thos. Carney	Machinist.	"
Name.	**Occupation.**	**Military Rank.**
COMPANY F, SECOND REGIMENT.		
G. W. Crippen	Clerk.	First Lieut.
A. A. Ross	Machinist.	Sergeant
W. S. Barriger	Electrician.	Corporal.
J. S. Button	Draughtsman.	"
C. W. Rexford	Machinist.	"
W. Todd	Machinist.	"
G. Boldt	Clerk.	Private.
W. Boldt	Vise hand.	"
J. Boyle	Machinist.	"
T. Boyle	Machinist.	"
J. S. Clinton	Clerk.	"
E. Clowe	Machinist.	"
F. Doozen	Winder.	"
H. B. Ford	Winder.	"
Wm. Fenton	Insulator.	"
F. Gabel	Machinist.	"
W. H. Gould	Core maker.	"
H. Henry	Mica cutter.	"
E. L. Jandro	Vise hand.	"
V. Jann	Winder.	"
E. Kliner	Machinist.	"
L. Lovett	Machinist.	"
F. McChesney	Wire winder.	"
R. F. Monges	Student.	"
W. McCreedy	Arma. winder.	"
F. Nivison	Machinist.	"
F. L. Reed	Electrician.	"
James Ralph	Vise hand.	"
J. Shaw	Moulder.	"
A. Smith	Arma winder	"
P. Stevenson	Core winder.	"
C. E. Waldron	Winder.	"
W. H. Wands	Mach nist.	"
C. Whitmyre	Wind r.	"
C. Van Vranken	Winder.	"

Motors in a Shoestring Factory.

The Westinghouse Electric and Manufacturing Company has recently completed a novel electric plant for the Fletcher Manufacturing Company, of Providence, R. I. This latter firm is over 100 years old. The original Fletcher manufactured shoestrings and sold them from wheel-barrows. The concern is now one of the most successful in Providence, employing about 600 hands making shoestrings, lamp wicks, etc. Until recently two engines were used by this plant, one on each side of the street. Desiring to shut down one of them it was found impossible to run a shaft under the street, but permission was secured to lay electric wires. The single engine will now operate the entire plant by running a 150-kilowatt, 400-volt, two-phase Westinghouse generator, which transmits current across the street to a 200 horse-power type "C" motor. The motor is left connected with the generator most of the time, thus enabling the two plants on the two sides of the street to start up together.

INSULATION AND CONDUCTION.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, MARCH 23, 1898, BY REGINALD A. FESSENDEN.

(Continued from page 314.)

As regards oil insulation for ordinary induction coils, the writer has not had sufficient practical experience. I believe, however, that very good results are obtained. With regard to the Thomson high-frequency coil,* there is no question of the efficacy of oil there, especially with regard to ease of repair. As is well known, however, the oil and coil should always be heated above 110 degrees centigrade for some time, if the best results are to be obtained. A very curious increase of insulating power for high frequencies in oil has been noted by Elihu Thomson, who has suggested that it might be due to inertia of the molecules of oil. To test this, one of the writer's students, Mr. Bennet, constructed a two-phase high-frequency electrostatic field. Though insulators placed in this rotated even when placed within a one-sixteenth inch glass flask, the effect was found to be due to air currents, and when these were eliminated no movement was obtained, so that the cause of this effect is still unknown, and it is doubtful if true dielectric hysteresis has ever been observed.

So far as Mr. Chattock's experiments and the experience of the writer go, there is not a great deal of difference between the dielectric strength of different substances. It is probably related to the tensile strength. As mentioned previously, the writer pointed out that there was strong evidence to show that the tensile strength of a substance was due to the mutual attraction of charges on the atoms and that the observed values agreed well with the calculated and followed the same law. Some time later Chattock† in a very interesting and able paper showed that, as the results of his experiments, the dielectric broke down when the slope of potential was great enough to pull apart atoms having charges of the same dimensions as the ionic charges. This was shown for gases, fluids and solids, and forms a very interesting—and, I believe, independent—corroboration of the writer's electrostatic theory of cohesion. Consequently, the nearer the atoms are together and the greater their rigidity, the greater also their dielectric strength.

Chattock's experiments give for solids and fluids :

Substance.	Volts per Centimetre for Breaking Down.
Glass	919,000
Water	1,050,000
Oil	930,000

which agrees well with the theory.

From the above it will be seen that if the materials are pure, and ohmic resistance is of not much importance, a compound having its molecules held together tightly will have a good dielectric strength for direct current voltages.

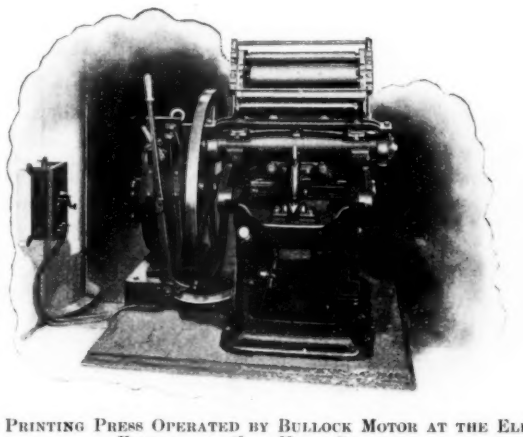
This paper is already so long that I can not touch in detail on the question of cables. There are also other papers in existence written by men better equipped for the task. I had intended saying something about what Siemens has called the "absurd craze for high insulation resistance," but the fact is now generally recognized, except by inexperienced engineers, that the best cables are those of medium ohmic resistance. I will only mention two methods which have occurred to me as feasible for certain purposes. One is based on the fact that the dielectric strength of air, as shown by the experiments of J. J. Thomson and Peace, increases very rapidly with the pressure at 90 pounds per square inch, being equal to that of a good quality of rubber. A similar plan, though not requiring any very large pressure, is due to Mr. Westinghouse, who thought of employing it four or five years ago in Philadelphia. The second occurred to the writer on reading Elihu Thomson's article on the use of liquid air as an insulator. It is this : Since ice at only 12 below freezing has a specific resistance of over 1,000 megohms, i. e., as good as some brands of insulation, why not make the conductors hollow, lay them in a trench filled with water, pass cold brine through the pipes, use the brine for cooling houses, making ice, etc., and let the frozen water act as the insulator. A rough calculation shows that this is commercially feasible, even neglecting all sources of profit from the furnishing of the brine (i. e., if it were used only for cooling the pipes). After making all allowance for friction of fluid, cost of power, etc., the balance comes at the right end, if the line is always fully loaded.

The question is sometimes raised, whether we can ever hope to have a non-inflammable substance which shall be elastic like india-rubber. The probable cause of the elasticity of rubber is known,* and it would seem as if there was no reason why such a substance should not be prepared. All we have to do is to coagulate one substance in the midst of another. In fact we have at present, in tetrametaphosphate of sodium, such a substance, elastic as rubber, transparent and tough, and when pure a good insulator. It would be an admirable material if it were not for the fact that the elasticity is due to water, and when this dries out it becomes brittle.

As regards an organic artificial rubber, I have very little doubt but that it will be made as soon as it is understood by chemists that its properties are due to structural and not chemical causes.

Armature Windings - The present methods of using mica leave little to be desired. The writer might mention, however, one novel method he used in a case where very heavy currents were to be carried. Asbestos and silicate of soda, as is well known, form a good coating, but is however, poor mechanically. The armature bars were wrapped with asbestos string and then coated with the silicate. This made, when dry, an extremely firm covering which could only be removed with a hammer. Though at first a bank of 100 lamps could be lit up through the insulation, after a little running it dried out to quite a high figure and the machine did good service, at one time running several hours, as I am informed on good authority, under such an overload that the carbon brushes were red hot.

(To be continued.)



THOMSON PRINTING PRESS OPERATED BY BULLOCK MOTOR AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

* Popularly known as the Tesla coil, on account of his having brought it into prominence through his use of it in his lectures ; though it was invented and first described by Elihu Thomson.

† *Phil. Mag.*, Dec. 1892.

* Molecular Physics, Franklin Institute, September 18, 1896.

THE ELECTRICAL SHOW.

Fifth and Last Week of the Exhibition at Madison Square Garden.

PLEASANT WEATHER BRINGS OUT A LARGE ATTENDANCE—A WEDDING IN THE MINIATURE CHAPEL—MASONS ATTEND ON FRIDAY NIGHT—THE SHOW WINDS UP ON SATURDAY NIGHT.

The fifth and last week of the Electrical Exhibition in Madison Square Garden, New York city, was chiefly remarkable for the fact that there were several days of sunshine and evenings without rain. The first four weeks of the show were marked by a run of rainy weather, which broke the record of the Weather Bureau in New York. During the fifth and last week large and appreciative audiences were the rule.

On Wednesday evening last an unusual novelty was provided. This was the celebration of a marriage in the miniature chapel, lighted with Moore vacuum tubes. It was a genuine "electrical" marriage, and was successful in drawing a large crowd.

During the past week the attendance of stationary engineers was gratifyingly large, although no special meetings were scheduled. Friday night was Masonic night, and a number of prominent Masons from New York and vicinity took the opportunity of visiting the show.

The closing of the Electrical Show is a fitting time to give credit to whom credit is due. In point of seniority Mr. C. O. Baker, Jr., president of the Electrical Exhibition Company, takes precedence. Mr. Baker devoted a great deal of his valuable time to the enterprise from the start, and his wide business experience and sage advice were repeatedly called upon. Mr. Baker believes that an electrical exposition of this sort should be held in New York every year, primarily for its effect upon the general public in familiarizing them with electrical progress and development. From this standpoint alone the show just closed produced marked

(Concluded on page 374.)

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]
TIMES BUILDING, 41 PARK ROW,
P. O. BOX 2330. NEW YORK.

NEW YORK, JUNE 8, 1898.

CHARLES W. PRICE, - - - - - - - EDITOR.
STEPHEN L. COLES, - - ASSOCIATE EDITOR.
STEPHEN H. GODDARD, ADVERTISING MANAGER.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," - - - NEW YORK.
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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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The country rings with praises of Lieutenant Hobson and his gallant men for their unparalleled pluck and daring at Santiago. And again has electricity proved itself one of the most efficient servants at the naval officer's command. Three cheers for the brain that conceived the "Merrimac" expedition and another three for the nerve that carried it to success!

THE MODERN NEWSPAPER BULLETIN BOARD.

The daily papers throughout the country, but especially those in New York city, have well nigh gone mad on the subject of war news bulletins. During our late Civil War newspaper bulletins consisted of a sheet of paper stuck on the side of the building, carrying brief dispatches from the front. Nowadays the bulletin is in the form of a blackboard, covering, in some instances, two or three stories of the building, and illuminated at night by many incandescent and arc lamps. A man handy with chalk is employed to write the dispatches on the blackboard as fast as they are received, and when they don't come fast enough he amuses the assembled multitude by drawing pictures in colored chalks. At night, when the war bulletins are scarce and the chalk artist is tired, the electricians of the building entertain the crowd by performing stunts with the electric lights. The usual crowd around the war bulletin is of average intelligence, and in all probability is attracted more by the spectacular effect than by a desire to read the alleged news.

A STREET RAILWAY DECISION.

Justice Woodward, of the Appellate Division of the Supreme Court in Brooklyn, N. Y., recently handed down an important decision in the case of John Jenkins against the Brooklyn Heights Railroad Company. While riding on one of the company's cars Mr. Jenkins received a transfer ticket at Fulton street and waited for a car on that line. Two cars passed but he did not board either one as they were crowded. When the third car came up he boarded it because there was a seat and handed his transfer ticket to the conductor. The conductor declined to receive it and demanded a cash fare, as the 10 minutes' time limit on the transfer ticket had elapsed. Mr. Jenkins refused to pay the additional fare, and, at the request of the conductor, a policeman ejected him from the car. He was taken to a police station where he was discharged. He sued the company for false arrest and assault, but the case was dismissed in the lower court. He appealed from this decision, with the result that the Supreme Court, through Justice Woodward, holds that it is not compatible with the statute for a street railway company to limit the time on a transfer ticket to 10 minutes, and that a passenger can not be compelled to stand up in a car, but is entitled to a seat. The court granted a motion for a new trial.

THE GENIUS OF INVENTION.

A very interesting question relative to the nature of invention has recently been under discussion in the columns of the technical press. It is an idea firmly fixed in the popular mind that inventions are produced only by persons peculiarly endowed by nature with what is called "the inventive faculty," a sort of inspiration of genius. This is, in fact, the basis upon which rests the whole system of our patent laws, which are framed for the encouragement of persons so endowed to use their peculiar faculty for the public benefit. It is remarkable that this idea is generally negatived by the very persons who might reasonably be expected to favor it—the inventors themselves. An eminent man of science has defined genius as "a capacity for endless hard work." Edison, when applied to for an opinion as to the inspiration of inventive genius, is said to have exclaimed: "Inspiration! Bah, it is perspiration." When the mists of prejudice have cleared away, it will doubtless be acknowledged that invention, like every agency in nature, is a process of evolution. Even in the case of such astounding achievements as the telephone and phonograph, which have startled the public with their apparent originality, the germ will be found by investigation in some long abandoned attempt which has failed because the times and means were not opportune. Lying dormant or struggling up through difficulty and failure until favoring conditions supervened, it burst upon the public view like a new creation, but to be followed by a long course of growth and improvement, with ideal perfection forever in the future.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The trend of security values generally during the first part of the week was distinctly upward. The movement, while due in the main to the manipulation of certain groups of stocks by large speculative and financial interests, also received some support from the buying of the general public following the first announcement of a naval victory off Santiago. Toward the end of the week there were many realizing sales and considerable taking of profits. On Friday the Senate's vote in favor of coining the silver seigniorage frightened many timid holders of securities and encouraged the bears to "hammer the market." Some sharp declines were scored. The downward movement was regarded, however, as temporary, conditions of the country generally being too favorable to warrant a continued recession in prices. Industrial, agricultural and commercial prospects are admittedly bright, money is abundant and cheap and Wall Street looks forward to another bull market this Summer, one that will eclipse last year's "boom."

General Electric was somewhat more actively traded in during the week, the price holding steady at 36½ to 37½. Much of the strength of the stock was due to the trustworthy reports that the company has been doing an exceedingly large business of late, much greater indeed than for years. Satisfactory progress is stated to be making in the matter of adjusting the impairment of the capital. None of the various plans submitted has yet been definitely accepted, but a decision in the matter is expected before long which will hasten the ultimate payment of dividends on the stock.

Western Union was more active than usual, the price advancing from 91½ to 92¾, later losing slightly over a point. The collateral trust 5's sold at 109 to 110.

North American was more active and sold up to 6⅜ on reports that the decision in favor of the Milwaukee Electric would in all probability put an end to the litigation over the four-cent fare and also meant a dividend. Later the stock quieted down on the announcement that the city would appeal from Judge Seaman's decision and also the absence of inside support.

Edison Illuminating of New York stock was quiet, only one sale taking place at 128. The bonds sold at 111¼ for the first 5's and a block of 25,000 of the consolidated 5's at 119. A meeting of the stockholders of the

Edison Electric Illuminating Company of Brooklyn was held on Thursday, at which they unanimously voted to increase the capital stock from $4,000,000 to $5,000,000. American Telegraph and Cable sold at 92 to 93.

The Chicago Telephone Company declared the regular monthly dividend of one per cent, payable June 5. Books closed June 1 and opened June 6.

Trading in electrical stocks on the Boston Exchange was slightly more active than of late. American Bell Telephone rose seven points on Monday to 275, later selling up to 277, and closing at 275. Erie Telephone ranged between 68 and 69; New England dropped from 128 bid, offered at 132, to 126@130; Westinghouse Electric was quoted at 20½@21½, and the preferred at 54@54½, with sales at 53 and 54.

In Philadelphia, Electric Storage Battery common sold at 22¾ and 24, and the preferred at 25. Pennsylvania Manufacturing Light and Power opened at 13⅜, selling up to and closing at 14. RAY.

Wall street, June 4.

ELECTRICAL CONVENTIONS.

DATES OF FORTHCOMING ELECTRICAL MEETINGS AND CONVENTIONS.

National Electric Light Association, twenty-first convention, Auditorium Hotel, Chicago, June 7, 8 and 9.

Northwestern Electrical Association, annual convention on lake steamer from Chicago to Duluth, June 10, 11, 12, 13 and 14.

American Institute of Electrical Engineers, general meeting, Omaha, Neb., beginning June 27.

Canadian Electrical Association, annual convention, Montreal, June 28, 29 and 30.

Philadelphia Electrical Exposition, Philadelphia, will be held during the entire month of June.

Trans-Mississippi and International Exposition, Omaha, Neb., June 1 to November 1.

The Association of Railway Telegraph Superintendents, annual convention, Omaha, Neb., June 15.

Prof. William L. Robb, who occupies the chair of physics and electrical engineering at Trinity College, Hartford, has been accepted as a commissioned officer in the First Regiment of Volunteer Engineers.

NORTHWESTERN ELECTRICAL ASSOCIATION.

ARRANGEMENTS FOR THE MID-SUMMER CONVENTION.

The executive officers of the Northwestern Electrical Association have completed arrangements for the midsummer convention of the association, which will assemble on board the steamer "Northwest," leaving Chicago, Friday, June 10, for Duluth, Minn. Stops will be made en route at Milwaukee, Mackinac Island, Sault Ste. Marie, to view the government canal and locks, Hancock and Houghton, Mich., to visit the famous Calumet and Hecla copper mines. It is understood that a local company at Sault Ste. Marie is hurrying to completion furnaces for electrically smelting nickel ore, which they hope to have in operation when the steamer reaches there.

Sessions will be held each day on the steamer. Among the papers and topics for discussion will be the following: "Measuring Instruments," "Transformers," "Meters," "Incandescent Lamps," "Engines," "Boilers," "Boiler Furnaces." Mr. W. S. Horry will read a paper on "The Electrical Smelting of Ores."

A business session will be held at Duluth on the steamer's arrival. There are many features of interest to electrical people at Duluth. At Superior, Wis., on Tuesday evening, the annual banquet will be held. The return from Duluth to Chicago will be made by special train.

PERSONAL.

Col. C. F. Sise, of Montreal, president of the Canadian Bell Telephone Company, visited New York city last week.

Dr. J. M. Culbertson, the general superintendent of the Bell Telephone Company, of Buffalo, was in New York city last week.

Mr. James Stowell Anthony, of the Cleveland office of the Walker Company, who has been in New York for several weeks, has been ill at the Holland House.

Mr. J. E. Wilkinson, secretary and treasurer of the Central Pennsylvania Telephone and Supply Company, of Williamsport, Pa., attended the Electrical Show at Madison Square Garden last week. Mr. Wilkinson reports that the telephone business in his territory is in a flourishing condition.

At the annual meeting of the stockholders of the International Bell Telephone Company, Ltd., of New York city, the following directors were elected: S. D. Babcock, Louis A. von Hoffman, Richard A. McCurdy, Charlton T. Lewis, Elisha S. Converse, Ferdinand M. Theriot, Howard S. Randall, Louis Thebeaud, Chas. T. Bell.

Mr. Gardiner C. Sims, of Providence, R. I., who recently received an appointment as acting past-assistant engineer in the navy and who was detailed for duty on board the repair ship "Vulcan," now at Charlestown Navy Yard, has received a commission from the navy department which promotes him to the rank of acting chief engineer. Mr. Sims's many friends in the electrical field know that he will fill acceptably any position to which the government may call him.

Omaha Exposition Opened.

The Trans-Mississippi and International Exposition was opened at Omaha, Neb., on June 1, at 1 o'clock P. M. President McKinley set the machinery in motion by touching an electric button in the White House at Washington. Immediately after opening the exposition, the President telegraphed the following message:

"HON. GURDON W. WATTLES,
President Trans-Mississippi and International Exposition, Omaha, Neb.:

"The cordiality of the invitation extended to me to be present at the opening of your great exposition is deeply appreciated, and I more deeply regret that public duties prevent me from leaving the capital at this time.

"The events of the memorable half century which the Trans-Mississippi and International Exposition commemorates are interwoven with the history of the whole nation and are of surpassing importance. The mighty West affords most striking evidences of the splendid achievements and possibilities of our people. It is a matchless tribute to the energy and endurance of the pioneer, while its vast agricultural development, its progress in manufactures, its advancement in the arts and sciences and in all departments of education and endeavor, have been inestimable contributions to the civilization and wealth of the world.

"Nowhere have the unconquerable determination, self-reliant strength and sturdy manhood of our American citizenship been more forcibly illustrated. In peace or in war the men and women of the West have ever been in the vanguard.

"I congratulate the management upon its magnificent enterprise, and assure all who participate in this undertaking of the deep interest which the government has in its success.

"WM. MCKINLEY."

June 1, 1898.

OBITUARY.

Mr. Fred A. Noll, well known to the electrical fraternity, died of Bright's disease on Monday of last week, and was buried in Greenwood Cemetery. Mr. Noll was a younger member of the Noll family, well known electricians, and was one of the sales agents of the Sprague Electric Company. He leaves a widow, and at the time of his death was about 40 years of age.

Bernard Moebius, the inventor of the electrolytic process of parting and refining gold and silver, which bears his name, died recently on a steamship while on his way to his old home in Germany. In 1884 he developed his electrolytic process and further improvement upon it in 1895. Plants in which his system is used are now established in all parts of the world. Mr. Moebius stood high in his profession, and was a member of many scientific societies.

Charles E. Emery, Ph. D., a well known consulting engineer, died on June 1 at his home in Brooklyn, N. Y., after an illness of several weeks, from heart disease. He was born in 1838, and entered the United States Navy in 1861 as an engineer. He took part in many of the important battles of the Civil War, and was with Farragut in all his engagements on the Mississippi. He resigned from the service in 1867, and was appointed consulting engineer to the United States Coast Survey and Revenue Service. While he held this position, he had charge of the construction of all vessels until such work was made a separate department in the navy. About 10 years ago Dr. Emery received the Tilford prize for the best paper read before the British Society of Engineers in London. He was a past president of the New York Electrical Society and a member of the Institute of Civil Engineers. He was also a non-resident professor of Cornell University and had been retained as consulting engineer on many important works, especially those dealing with water supply. His funeral occurred on June 3, and was attended by many well known scientific men.

At a meeting of the North Jersey Street Railway Company, of Jersey City, N. J., the following officers were elected: President, E. F. C. Young; vice-president, David Young; secretary, Wilbur F. Johnston; treasurer, E. N. Hill, and auditor, E. D. Hibbs. The directors are E. F. C. Young, David Young, J. K. Corbiere, A. J. Cassatt, John W. Omberson, John F. Kehoe, William J. Davis, Dudley Farrand and Wilbur F. Johnston.

A Corliss Engine of Improved Construction.

In nothing is the process of development more strikingly exemplified than in the history of the steam engine. From the crude and uncouth "fire pump" of Newcomen to the steel-thewed giants that now create and distribute the wealth of the world is as truly a process of evolution as from Professor Marsh's *orohippus* to the modern race horse. The inventions in this field of George H. Corliss are frequently pointed to as an example of the exercise of the highest inventive genius. Yet these, though constituting so great an advance as almost to revolutionize the science of steam engineering, were but a step—a long one, indeed—in the endless march of improvement. Old imperfections were overcome, but weak points still remained. This is but saying that the highest product of inventive skill is imperfect and that improvements are always possible. The steam engine of to-day is a vast advance upon the stage at which Corliss left it.

These thoughts have been called forth by an examination of a new engine of the Corliss type, which has just been brought out by the Atlas Engine Works, of Indianapolis, Ind., well known throughout the country as builders of steam engines and boilers. The following is a brief description of what may be considered the latest advance in the construction of this style of engine:

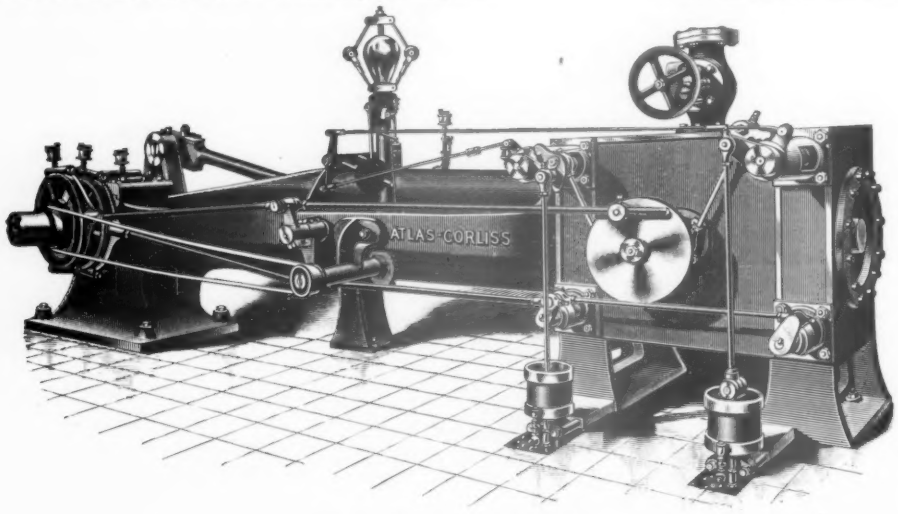


FIG. 1.—ATLAS-CORLISS ENGINE.

The general form and appearance of the engine is well shown in the illustration, Fig. 1. The frame or bed plate is of the girder type, originally designed by Horatio Allen, of the old Novelty Iron Works, New York city, which has so generally been adopted by builders of this class of engines as to be popularly known as the "Corliss bed plate." It is, however, unusually massive and rigid, being cast in a single piece, but provided with a main-shaft bearing, having removable parts with wedge adjustment. The construction of this very important detail is shown in Figs. 2 and 3.

The cylinder is of somewhat peculiar construction. The ends, which contain the valve chambers and the steam and exhaust ports, are cast and finished separately from the middle part, or cylinder proper, through which the piston traverses. The parts are so constructed that when bolted together the piston runs over no joint, while the clearance is kept as low as in the usual form. This construction affords some advantages in the building of the engine, but its principal interest for the purchaser is the fact that it insures a more perfect bore, free from the flaws and shrinkage strains which the presence of cored passages is apt to engender, and that, being made to gauges on the interchangeable plan, it is possible to renew, at a comparatively small expense and delay, a part injured by accident, which would otherwise entail the sacrifice of the whole cylinder. When completed, the cylinder is covered by a steel plate lagging, which leaves a space packed with non-conducting material, and gives a neater appearance than the ordinary lagging of wood.

The steam and exhaust valves are of the usual rocking or "Corliss" type, but are so constructed that they open their ports at two places, thus giving the full opening with but half the usual motion. The ports are of ample size to permit the high piston speed demanded by modern practice. The construction of the piston rod cross-head is shown in Fig. 4. A comparison of this massive and perfectly adjustable detail, with the puny-looking device which it replaces in the earlier makes of Corliss engine, will show clearly where one weak point has been eliminated. The cross-head and crank pins are of steel, having unusually large wearing surfaces.

The main shaft is of hammered iron, having a diameter in the bearings equal to half the diameter of the cylinder, and a length of bearing equal to the cylinder diameter. The band or flywheel is of sufficient weight to store the *vis viva* required for uniformity of speed. The wheel arms are of oval section, smooth and symmetrical, joining the hub and rim with generous fillets and so proportioned as to provide a very large factor of safety as security against the accidental bursting which has in recent years been so common a cause of steam engine disasters. The governor (Fig. 5) is of the Porter type, driven by a belt. It is provided with a safety-stop motion, which, should the belt run off or break, stops the engine and prevents accident. When in the position for starting, the governor is supported by a latch, which, upon the engine attaining its speed, drops aside automatically, leaving the safety device free to operate without further attention from the engineer.

The widest departure from the ordinary construction is, however, to be seen in the valve gear. The steam valves are operated from the usual wrist plate driven by an eccentric on the main shaft, but the exhaust valves are operated by a separate eccentric. In the ordinary construction, where all the valves are driven

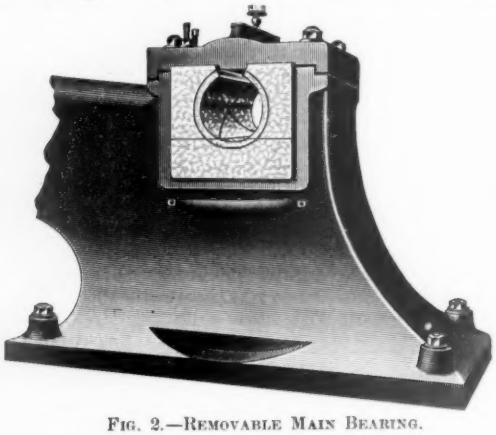


FIG. 2.—REMOVABLE MAIN BEARING.

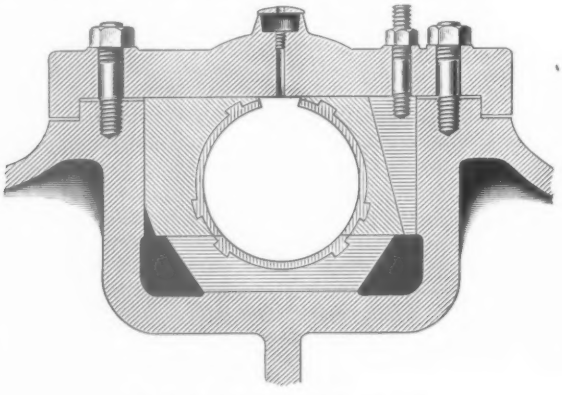


FIG. 3.—SECTION OF MAIN BEARING.

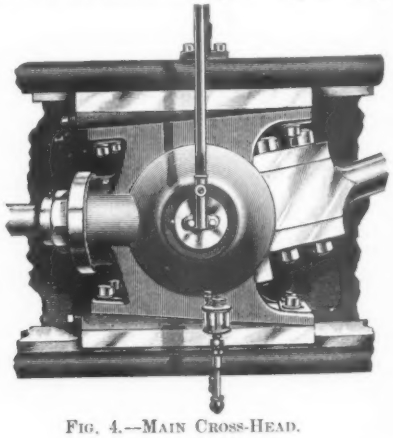


FIG. 4.—MAIN CROSS-HEAD.

from the wrist plate and one eccentric, the motion necessary for the exhaust valves limits the period of cut-off so that it can not occur later than about three-eighths of the stroke. This would be no disadvantage provided the load of the engine was constantly within the range of the cut off. Then the speed will fall off and fluctuations occur which the governor can not control and serious accidents may result. But with the independently driven steam valves, the range of cut-off may extend to three-fourths of the stroke, enabling the engine to pick up and carry a load more than double its ordinary rating without loss or fluctuation of speed; and this ability to meet emergencies is attained without in any way detracting from its economical efficiency or impairing its perfect regulation. A departure from the ordinary practice is also seen in the mode of conveying the motion of the wrist plate to the steam valve. This is usually done by a rod connecting the wrist plate with one of a bell crank pivoted upon the valve stem bracket, the other arm of which engages an arm on the valve stem, from which is suspended the dash-pot. In order to close the valve quickly the dash-pot is given a downward pull of several hundred pounds, according to the size of the engine, which, in order to open the valve, must be suddenly lifted at the beginning of every stroke. By the bell crank construction this resistance is doubled over the valve-stem bracket, which is the fulcrum of the lever. These sudden and violent strains cause a tendency to wear and to throw the valve stem out of line, besides entailing an unnecessary amount of friction. In the improved construction shown in this engine (Figs. 6 and 7) the wrist-plate rod in opening the valve pushes almost directly upward upon the arm carrying the dash-pot, so that there is no doubling of the strain across the valve-stem bracket. The strain on the wrist plate is the same in each case, but in the latter, that upon the bracket is almost eliminated.

The form and action of the device which engages and releases the steam valve has seemed to invite the best efforts of the improvers of the Corliss engine, and it is a detail which has undergone many modifications. In this engine it presents the most unique improvement. In all the forms hitherto devised the hook part has been arranged to reach over and take hold on the outer edge of the catch. In such an arrangement the catching motion is opposed both by gravity and by the centrifugal force generated by the motion. A spring was, therefore, necessary to throw the engaging parts in contact, and the failure of this spring from weakening or breaking has been a constant source of trouble. That construction also materially limited the practicable speed of the engine, for above a certain speed the centrifugal force would overcome the tension of the spring and the hook fail to catch on. In this valve gear the hook is arranged to catch on the inner or centerward side, to which it is impelled both by gravity and by centrifugal force. No spring, therefore, is necessary, and engagement is said to be certain at any speed. The device consists of but a single moving piece, the motion of which is limited to the exact amount required, so that in operation it is practically noiseless. The engaging parts are hardened steel plates, which may be shifted so that eight different edges may be successively worn off before it becomes necessary to renew them. The dash-pots are of the vacuum sort, of improved construction, devoid of springs or other details liable to rapid wear or breakage.

The engine is provided throughout with the most approved automatic sight-feed oiling devices, and is adapted for continuous working. Taken altogether, this engine, for well selected material, perfect adaptation of parts, good workmanship and finish, deserves to rank as a worthy example of engineering skill.

It is the purpose of the builders to carry in stock for prompt delivery simple engines of this construction from 75 to 500 horse-power, and they will be prepared to furnish at short notice tandem or cross-compound double engines up to 1,000 horse-power in capacity.

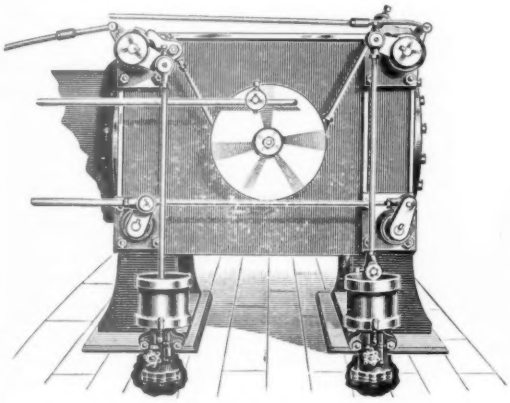


FIG. 6.—CYLINDER.

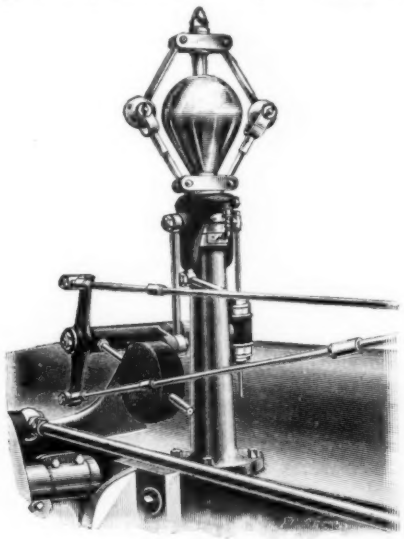


FIG. 5.—GOVERNOR.

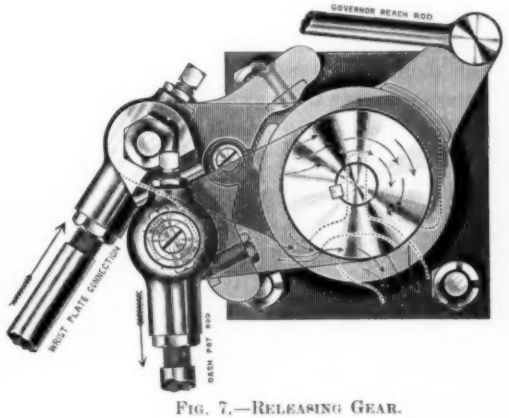


FIG. 7.—RELEASING GEAR.

Association of Railway Telegraph Superintendents.

The seventeenth annual convention of the Association of Railway Telegraph Superintendents will be held at Omaha, Neb., on June 15. It was originally intended to hold the convention at Hot Springs, S. D., but owing to the damage to the grounds by a cloudburst, the committee of arrangements recommended a change of place of the annual meeting, and the executive committee announces that the convention of the association will be held at the Hotel Dellone, Omaha, Neb. The executive committee is composed as follows: J. W. Lattig, president; W. W. Ryred, vice-president; P. W. Drew, secretary and treasurer.

Fire and Police Telegraph Superintendents.

The third annual convention of the fire and police telegraph superintendents and municipal electricians will be held at Elmira, N. Y., on August 9 and 10. Several papers will be read by well known electricians.

Industrial Exposition in South Africa.

Under date of April 18, 1898, Consul-General Stowe, of Cape Town, says:

"I am requested to present to the manufacturers and producers of America the advantages of exhibiting their productions at the exhibition to be held at Grahamstown, Africa, from December 15, 1898, to January 21, 1899.

"It will be known as the South African Industrial and Art Exhibition, and is guaranteed by the governors of Cape Colony, South African Republic, Orange Free State and Natal, and the high commissioners of Rhodesia and Basutoland. Over $100,000 have been subscribed, and exhibits from all parts of the world have been asked.

"There are five classifications of exhibits, viz.: (*a*) Raw materials; (*b*) manufactures; (*c*) mining and machinery; (*d*) natural history and science; (*e*) arts.

"To the manufacturers of agricultural implements and vehicles, and mining, cotton, woolen, electrical, woodworking, brickmaking, sugar, and all other kinds of machinery, this exhibition will be invaluable."

The Varley Magnets in the West.

The Central Electric Company, of Chicago, announce that they have taken the agency for the products of the Varley Duplex Magnet Company, of New York, manufacturers of magnets of every description, and will carry in Chicago stock all styles of standard coils for telephone construction. Special designs will be furnished on application. The Varley magnets are well known, are made under the personal supervision of Mr. Varley, and the enterprising Central Electric Company will undoubtedly secure a large business in handling them.

THE ELECTRICAL SHOW.

(Continued from page 369.)

and satisfactory results. Mr. Baker, as is well known, is the largest manufacturer of platinum in the world, and has many valuable connections in the electrical field. He is also Master of Transportation for the National Electric Light Association. It was chiefly from this cause that he took the interest he did in the Electrical Exposition. For the benefit of those few persons who have not met Mr. Baker the ELECTRICAL REVIEW takes pleasure in presenting his portrait in this issue.

Mr. Marcus Nathan occupied with success and satisfaction to all concerned the arduous position of general manager of the Electrical Exhibition Company. The phenomenal work of preparation accomplished by him during the week preceding the opening of the show will go down in the annals of emergency construction as one of the most rapid and completely performed tasks of the sort. Mr. Nathan's experience as an electrical contractor and engineer, as well as the precedents he established during the electrical show in New York two years ago, stood him in good stead in the present case. The multifarious duties and annoyances devolving upon the general manager of an exhibition of the size of that held in Madison Square Garden were handled by Mr. Nathan with a judgment and quiet force which showed that the right man was in the right place. The question of passes alone was enough to drive an ordinary man to suicide.

EXHIBITION NOTES.

The India Rubber and Gutta Percha Insulating Company, manufacturers of the famous "Habirshaw" wires and cables, have an unusually attractive exhibit. They show a large variety of wires and cables neatly arranged on glass shelves in a very handsome glass case. This exhibit stands out prominently and has attracted considerable attention.

The Bullock-Thomson exhibit is one of especial interest. A complete modern electric printing plant is shown in full operation, the John Thomson Printing Press Company exhibiting their presses connected with the well known Bullock motors.

From the exhibit of the Monarch Manufacturing Company, of Waterbury, Ct., one can easily understand the working of the Monarch engine stop and automatic speed limit, which are shown in actual operation. The Monarch stop is shown mounted upon one end of a table. An eight-inch globe valve is at the opposite end, connected by sprocket wheels and chain to the stop. This globe valve may represent the throttle valve on an engine's cylinder, or a stop valve

MR. C. O. BAKER, JR., OF NEW YORK CITY, PRESIDENT OF THE ELECTRICAL EXHIBITION COMPANY.

on a boiler, both being handled alike by the Monarch stop. As a handwheel is turned to open the valve the two sprocket wheels and chain cause the drum of the stop to revolve around its central shaft, and while thus revolving it winds a flexible wire cord around itself, thus elevating weights which are connected to the opposite end of this wire cord. These weights, when thus elevated, indicate that the valve is completely open, allowing steam to pass through.

A number of electric push-buttons are placed in various positions about this booth, and when any one of these is touched a temporary magnet in the engine stop is energized, which attracts an armature and releases the mechanism which holds the weight in the elevated position, and the valve is thus closed in three seconds after making the twelve turns which are necessary to send it from a full opening to a complete closure. On a front counter at the left one of these engine stops is shown with the cover raised, and at the left, inside of this stop, is a large air dash-pot or air cushion. This is to arrest the very rapid motion of the closing valve just before it reaches its seat, thus causing it to seat easily but still firmly. If this provision were not made the seats of the valve would soon be destroyed. At the same time that a push button is touched an electric gong at the rear of the booth rings, thus notifying an engineer that his engine or boiler valve is being closed from some distant point, and this bell will continue to ring until either the switch contained in the stop is thrown out or the stop mechanism is reset ready for the reopening of the valve.

Mounted on a table at the left of the exhibit is a Monarch automatic speed limit. There is also a second speed limit with its cover raised. In actual service this device is belted directly to the crank shaft of an engine, and is thus kept revolving whenever the engine is in operation.

MR. MARCUS NATHAN, OF NEW YORK CITY, GENERAL MANAGER OF THE ELECTRICAL EXHIBITION COMPANY.

It contains a governor composed of two balls, each one being mounted upon a flexible flat-leaf spring. These springs are fastened securely at one end to a collar fixed upon its central shaft, while the opposite ends are connected to a second collar which slides backward and forward upon the shaft, its position being determined by the size of the circle described by the two governor balls. When the speed of this instrument is increased beyond a certain number of revolutions (which corresponds to the normal speed of the engine) the sliding collar makes a contact with two separated fingers, from which electric wires are run to the stop. As soon as this contact is made the circuit is closed and the valve is rushed to its seat in precisely the same manner that it is operated when a push-button is touched. When the revolutions of the engine exceed a certain predetermined safe speed its throttle-valve is closed almost instantly, thus making a flywheel accident impossible, and also preventing a wholesale blowing of fuses.

In this exhibit a Crocker-Wheeler motor is substituted for the revolving crank shaft of an engine and by means of a rheostat the speed of the motor can be easily varied. When the motor is revolving at a speed that drives the speed limit about 400 revolutions per minute the speed limit does not affect the stop, but as soon as the handle of the rheostat is turned, causing the motor to increase its speed, the stop valve is closed immediately, as has just been described.

In order to illustrate the sensitiveness of this instrument a Schaffer & Buddenberg tachometer is connected to it, and from this tachometer the exact speed at which the speed limit is being operated can be easily read off, and by its use it is shown that the excess of even one single revolution above the 400 revolutions (to which speed this instrument is set) will cause it to close the electric circuit and thereby cause the stop to close the valve.

At the rear of this exhibit is a Monarch stop controlling an A. & F. Brown friction clutch, which is disengaged instantly by merely touching any one of several push-buttons placed about the booth. When a button is touched and the elevated weight allowed to fall, the revolving sprocket wheel draws its encircling chain, with the clutch-lever attached, in the direction necessary to throw out the clutch. The clutch-pulley is revolved by a small Crocker-Wheeler motor, and when the clutch is thrown in, by moving the lever towards the pulley, the shaft, of course, revolves, and as soon as one of the push-buttons is touched the Monarch stop causes the lever to be pulled away from the clutch-pulley and the main shaft ceases to revolve instantly. By this device, when the Monarch stop is applied to a clutch, press-buttons may be run to various points in a factory, some being placed upon dangerous machines, so that in case any one is caught in a machine, belting or shafting they can press the button and stop the machinery instantly. One of the illustrations herewith shows the application of the Monarch stop and automatic speed limit to the large vertical engine ex-

hibited by the New York Safety Steam Power Company, while the other shows this stop and speed limit applied to the Woodbury engine, exhibited by Messrs. Burhorn & Granger.

The showing made by the MacIntire system of arc lighting was pronounced by very many as being the particular attraction of the entire exhibition in the way of electric lighting. The principles involved in the construction of the MacIntire lamps are certainly a departure from anything heretofore attempted, both in the way of ornamental designs and in the fundamental uses and adaptation of arc lighting. Mr. George F. MacIntire, the inventor, deserves much credit for his advanced ideas, particularly for his work along the lines of interior illumination by the arc system, in the way of pendant shadowless lamps of small sizes and ornamental designs, also for the artistic column lamps.

Among some of the special styles in which the MacIntire lamp is being made, several are worthy of special mention. The "Baby" lamp, 10 inches in length, is particularly unique. It burns for 60 hours with a soft, steady light of about 200 candle-power. The "Empire" lamp for pedestals and grand stairways is artistic. The "Stalactite" is another which is attractive for interior decorative effect. Also the "Isabella," which is made with cut-glass effect, is another for ornamental use. For central stations and general outdoor use, the hooded, reflecting lamps are new in design. The International Arc Light Company, of New York, the makers of the MacIntire arc lamp, have accomplished results which will be of interest to all students of electric lighting.

The Cox Thermo-Generators Made in This Country.

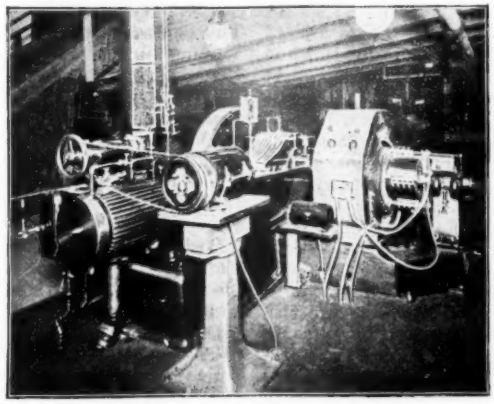
A factory has been equipped in Brooklyn for the manufacture of the Cox thermo-electric generators. Since this generator was invented some modifications and improvements have been made, which will be incorporated in those manufactured in this country, as heretofore all that have been sold in the United States were manufactured in England. Two types of the thermo-electric generator, each giving six watts on closed circuit, are now being made and can be delivered as ordered. The first of these types gives five volts on open circuit and four amperes on a closed. The second gives 10 volts on open circuit and two amperes on closed circuit. It is believed by the owners that the future of this compact little apparatus for the direct generation of electricity will play an important part in the lighter work, such as running electric fans, operating local telegraph sounders, bells, operating phonographs, and galvanoplastic work, such as gold and silver plating. The generators are also adaptable for charging storage batteries such as might be used by dentists, for X-ray work, or for the operation of automatic pianos.

With the completion of the equipment of the factory, a new company has been inaugurated for the introduction of this generator in America, the style of which will be the Thermo-Electric Company, with offices at 102 Times Building, New York. The business management will be under the guidance of Mr. Ellis Langville.

Mr. M. J. Wightman will be the consulting electrical expert for the company, and Otto Rothenstein the superintendent. The officers of the company include several gentlemen prominent in mercantile lines. Col. A. G. Paine is the president.

ELECTRIC LIGHT FLASHES.

The Citizens' Electric Light Company, of Xenia, Ohio, has been incorporated, with a capital stock of $10,000.



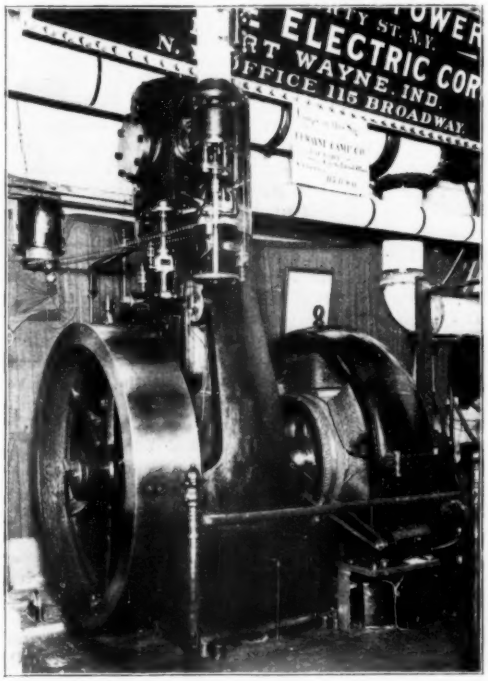
THE MONARCH ENGINE STOP ATTACHED TO A HORIZONTAL ENGINE AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

Mr. Gottfried, of Chicago, Ill., is erecting a $15,000 electric light plant at Elkhart Lake, Wis.

The contract for an electric light plant for Lehighton, Pa., has been awarded to the Fort Wayne Electric Corporation for $18,800.

The plant and franchises of the Dubois, Pa., Electric Light, Power and Heat Company have been sold to a new company for $5,000.

The Wilmington, Del., City Electric Company and the Wilmington Heat and Power Company are reported to have consolidated, and an extensive plant will be built.



THE MONARCH ENGINE STOP ATTACHED TO A VERTICAL ENGINE AT THE ELECTRICAL EXPOSITION, NEW YORK CITY.

The Lodi, N. J., Light, Heat and Power Company, with a capital stock of $100,000, has been incorporated. Incorporators, Frank T. Ternes, Philip S. Hoffman and Charles I. Ternes, of New York.

The Heckert Light Company, of Findlay, Ohio, has been incorporated by Henry W. Seney, Charles K. Friedman, Horton C. Rorick, G. G. Fenneberg and Curtis T. Johnson; capital stock, $10,000.

The directors of the Consumers' Electric Light, Heat and Power Company, of Elizabeth, N. J., have purchased the Suburban Electric Light Company, and elected William H. Davis, of Harrison, as president, and Spencer Weart, of Jersey City, as counsel.

The stockholders of the Edison Electric Illuminating Company of Brooklyn, N. Y., met on June 2 and authorized the directors to increase the capital stock from $4,000,000 to $5,000,000. The money is to be expended in extending the plant and buying out the Municipal Electric Light Company.

The Gwynn's Falls, Md., Power Company, with a capital stock of $100,000, has been incorporated by Joel C. Dunbracco, Edmund M. Hoffman, E. Scott Merryman, Philip H. Hoffman and John G. Wescott. The company is formed for the purpose of converting the water-power of the falls for manufacturing purposes.

Bids have been opened by Henry S. Kearney, Commissioner of Public Buildings, Lighting and Supplies, for street lighting in the Borough of Brooklyn, N. Y. The lowest bidder was the Kings County Electric Light and Power Company, which is controlled principally by Roswell P. Flower, William Berri, Felix Campbell and Seth L. Keeny.

The People's Light and Heat Company, of Hot Springs, Ark., has been incorporated. The incorporators are H. W. Perry, of Birmingham, Ala.; C. T. Robinson, of Pulaski, Tenn.; J. B. Wood, E. A. Douglas, S. H. Stitt, L. D. Cooper, Jno. G. Lonsdale, C. E. Harrell, Ed H. Johnson, F. C. Stearns and W. J. D. McCarter, of Hot Springs. The purpose of the company is to furnish light and heat; capital stock, $25,000, of which $20,000 has been subscribed.

SUBMARINE TELEGRAPHY.

A DESCRIPTION OF THE CABLE LINES OF THE WORLD.

To the Editor of Electrical Review:

Considering the immense benefits which have resulted and now accrue from submarine telegraphy, whereby time and distance are practically annihilated, it is a matter of surprise that no popular descriptive account has yet been given of the world's leading cables and their principal land-line communications. In the following statement, which has been prepared with much care, we hope to supply this desideratum to an appreciable extent.

The cable connections between this country and Europe are most numerous, and it is by these that communication is carried on between Great Britain and her West Indian colonies. Of the 10 lines, four belong to the Anglo-American Telegraph Company, one to the Direct United States Company, one to the Telegraph Company of Paris and New York, two to the American Cable Company (leased by the Western Union Telegraph Company, of New York), and the remaining two to the Mackay-Bennett Cable Company. The terminals of three of these are at Valentia, Ireland, and Newfoundland; those of a fourth at Ballingskellig Bay, Ireland, and Tobay, Nova Scotia. The ends of two other cables are at Waterville, Ireland, and Cape Canso, Nova Scotia, and of two more at Penzance and Cape Canso. The ninth and tenth cables lie between Brest and St. Pierre. All the terminals on this side of the Atlantic are, of course, connected with wires to Canada and the United States, near the shores of which the cables are occasionally damaged and broken by fishing craft.

After reaching this country messages are transmitted to Florida by the wires of the Western Union Land Telegraph Company, and thence by the International Ocean Telegraph Company to Havana, continued by the lines of the Cuba Submarine Telegraph Company, which ends at Santiago de Cuba. The connection is extended by the West India & Panama Telegraph Company, whose line runs from Santiago to Jamaica and from Jamaica to Colon and Panama. Bermuda, which is about 800 miles from the nearest of the British West Indian colonies, is connected with Halifax by the Halifax-Bermuda cable, an extension of which has lately been made to Jamaica by way of Turks Island.

South and Central America are communicated with telegraphically by the duplicate cables of the Eastern Telegraph Company and the Brazilian Submarine Telegraph Company. The wires of the former extend from Penzance, in England, to Lisbon, in Spain, and are continued to Pernambuco by the cables of the latter company, with stations at Madeira and St. Vincent. At Pernambuco these lines join those belonging to the Western & Brazilian Telegraph Company, extending northward as far as Para at the mouth of the Amazon and southward to Montevideo. There are 13 or more telegraph stations on this line between Para and Montevideo. At the last-mentioned port the line is continued to Buenos Ayres, the extreme point on the east coast of South America, by the cable of the River Plate Telegraph Company.

From Buenos Ayres there is a land-line telegraph, belonging to the Trans-Andine Telegraph Company, to Concepçion, near Valparaiso, on the west coast of South America, where it joins the cable of the West Coast of America Telegraph Company to Chorrillos, in Peru, whence it is extended by a short land line to Lima, and thence to Callao, where it joins the Central & South American Telegraph Company, and is continued to Salina Cruz after touching Panama and other places. At Panama the connection between this port and the West India & Panama Telegraph Company's cable is by a land line to Colon, and thence by a branch line belonging to that company between Colon and Jamaica. Messages between Panama and the West Indies can also be transmitted by the cable of the Central & South American Telegraph Company to Salina Cruz and then across the isthmus to Vera Cruz, where it joins the cable of the Mexican Telegraph Company, and stretches to Galveston, in Texas, at which point it is connected with the West Union Land Telegraph Company. This, as before mentioned, communicates with the West India & Panama Telegraph Company. In the North Pacific, from Salina Cruz to Vancouver Island, there is no cable communication, nor is there any telegraphic touch with the Falkland Islands. About 17 or 18 ports can be telegraphed to by cable between Concepçion and Salina Cruz in the South Pacific, including Valparaiso, Callao and Panama. To Vancouver Island the only telegraphic communication from England is through Canada or the United States, and from the South Pacific by a very devious and uncertain route.

The cables to the Continent of Europe from the United Kingdom are very numerous. On the east coast of Scotland and England four cables belonging to the Great Northern Telegraph Company, of Copenhagen, extend to the Scandinavian countries and terminate separately in Denmark, Sweden and Norway. By means of these lines there are duplicate and partly triplicate routes to Denmark, Norway, Sweden and Russia. In the latter country two of the lines terminate in St. Petersburg and Moscow, and are thus feeders, not only of the important Siberian land line which conveys the traffic of the Great Northern Company to Japan, Corea and China, but also of the south of Russia, Asia Minor and Persia.

There is also a cable from Lowestoft in England to Emden in Germany, and another from Valentia in Ireland to that continental terminal through the English Channel. Both belong to the German Union Telegraph Company, but are worked by the Submarine Telegraph Company. This company also owns seven cables, which run as follows: One from Dover (England) to La Panne in Belgium; one from Ramsgate to Ostend; one from Dover to Calais; one from Dover to Boulogne; one from Beachy Head to Dieppe; another from Beachy Head to Havre; one from Jersey (Channel Islands) to Piron near St. Malo.

Two cables also extend from Lowestoft to Zandvoort in Holland, belonging to the British Post Office, and worked by the Submarine Telegraph Company.

The Anglo-American Cable Company have also a line connecting Brest with Salcombe in England; the Mackay-Bennett Cable Company one between Havre and Waterville in Ireland, and the Telegraphic Company of Paris and New York one between Brest and Penzance. These three last-mentioned cables are in connection with their owners' transatlantic lines. The Direct Spanish Telegraph Company have one cable from Cornwall (England) to Bilbao in Spain.

With regard to telegraphing to India, the Far East, Australia and South Africa, one of the cables to Lisbon of the Eastern Telegraph Company proceeds to Gibraltar, Malta, Alexandria, Cyprus, Aden and Bombay. This company also leases a line direct from London to Marseilles, the latter place being connected with Malta by its own cable. If such lines are severed between the Land's End and Gibraltar, the places referred to in the Mediterranean can be communicated with through Spain by the Direct Spanish Line, or through France, and from Marseilles to Barcelona by land lines, or from the former port by one of the three cables running to Algiers.

A further communication can also be made by the cable to Alexandria from Candia, Cyprus to Alexandria, and from Port Said to Alexandria.

From Aden to Bombay telegraphic communication is maintained by the cables of the Eastern Telegraph Company, which are connected with other towns on the Indian coast by the land lines of the Indian Government. There are two other telegraphic routes to India from Europe, one by the wires of the Indo-European Telegraph Company to Teheran and thence through the Persian Gulf where it is connected with the Indian Government line. The third route to India is the Turkish route through Fao and Kurrachee.

The connection between Madras and the Far East, and between Madras and Australia and New Zealand, is as follows: There is a cable from this Indian port to Penang, and another from Rangoon to Penang, while duplicate lines run from the latter place to Singapore, connecting Malacca en route. One thence extends to Cape St. James, which communicates with a cable belonging to the French Government, stretching to Hué, and afterwards to Kaiphong in the Gulf of Tonquin, and onward to Hong Kong. There is another cable from Cape St. James to Hong Kong. This British colony and Shanghai are connected with three lines of telegraphic wires, two of which are cables, while the third is a land line. These cables belong to the Eastern Extension and the Great Northern Telegraph companies, and touch at Amoy and Foochow. They are connected with the Imperial Chinese land line net which now extends as far as the capital of Corea. There is also a duplicate cable belonging to the Great Northern Telegraph Company from Shanghai to Nagasaki in Japan, and from this last-mentioned place to Vladivostock, in Russia, whence messages are transmitted through Siberia to Europe, as already described. This same company have further laid down a cable between Japan and Fusan, in Corea.

A further cable is laid down between Hong Kong and the Philippine Islands. A land line connects Bangkok, in the Gulf of Siam, with Cochin China, and the communication is extended by a cable from Cape St. James to Singapore. From this last-mentioned port Great Britain maintains touch with Australia by two cables, one of which has a terminal at Batavia and the other at Banyuwangy, both in Java. A land line joins the cables at the former place from Sinkel, in Sumatra, and from Batavia to Banyuwangy there is a duplicate land line, while from the latter place to Port Darwin, in Australia, there is a duplicate cable a considerable distance apart in the center of the route. Various parts of Australia are connected with land lines from Port Darwin, and there is a single cable from Sydney to New Zealand, and from Melbourne to Tasmania.

Telegraphic touch with the cape is supplied by the Eastern and Southern African Telegraph Company by a cable from Aden, with stations en route at Zanzibar, Mozambique, Delagoa Bay and Port Natal. Land-line connection extends from the last place to East London, Port Elizabeth and Cape Town. The west coast of Africa is served by the African Direct Telegraph Company, in contract with and subsidized by the British Government. By this line direct cable communication is established between Great Britain and her West African colonies and possessions. The French and Portuguese possessions, and other places on the west and southwest coast, are communicated with by the cable of the West African Telegraph Company, starting at Senegal. Telegraphic communication with Europe is also enjoyed by the following places—all belonging to France: Conakry, Grande Bassam, Port Novo and Gaboon; as also by the Portuguese possessions of Balama, Bissao, St. Thomé, Loanda, the

Congo, Novo Redendo, Principe, St. Paul de Benguela and Mossamedes. The Spanish Government has also connected Fernando Po with this system.

This long array of names may appear to be very much of the nature of a geographical exercise to unaccustomed readers, but it represents one of the most wonderful transformations wrought by civilization. The changes resulting from this network of intercommunications are vast beyond description.

The question as to how submarine cables are affected by currents and tropical and other seas has not been very well determined, but the remedies for the adverse conditions vary and have to be applied as experience is gained of the local cause. Some cables will last longer than others, and progress has been made recently in bettering their condition. At the terminals and in shallow water they are much heavier than in mid-ocean. All the leading cable companies employ several repairing ships, which have experienced engineers on board to grapple, splice and repair the lines, and each steamer carries a sufficient quantity of new cable.

A submarine cable costs about five times as much as a land line, while the maintenance is far more expensive, while it is exposed to war risks which must be provided for out of a reserve fund.

In consequence of the enormous charges for the transmission of long-distance submarine messages, the commercial community have adopted and greatly developed the use of code language. This consists of all the words common to eight specified languages. But there are codes consisting of a great number of make-up words unknown to any tongue. By such system, which is not always fair to the cable companies, about ten or more words on the average can be sent by paying for one only. According to a mercantile telegraphic code before us, the under-mentioned words indicate, for submarine telegraph purposes, the sentences or phrases immediately following them, namely:

Elgin (- - —). Every article is of good quality that we have shipped for you.

Standish (- —). Unable to obtain any advance on bills of lading.

Penistone (—). Can not make offer. Name lowest price you can sell at.

Coalville (- —). Give immediate attention to my letter.

Forfar (- —). At the moment of going to press we received the following.

Strange to say, the word "unholy" has been transmitted by the submarine cable to express no less than 160 words, and another English word to indicate more than 200.

The cable companies do not, however, object to the use of proper words, no matter how extensive their arranged meaning is, but to words unknown to any language. The additional time required to cable the latter, and the trouble they give the operators, is very great and annoying.

In defense of this code practice, it is urged that without it the cost of telegraphy would be so immensely increased that commercial men doing a small business would not be able to avail themselves of the cables to a tithe of the extent they now do, and that the world's commerce would therefore be greatly diminished and severely injured.

The use of cables which can not be adequately protected from severance in war time is a matter likely to engage increased attention. In case of hostilities arising with a strong maritime power, it might involve most serious consequences if we were cut off from foreign news or could not regulate our business affairs in the manner we have been accustomed to. Much business would naturally be prevented and delayed, and deplorable failures would occur, in the case of countries with foreign possessions, to protect these possessions from attack by the enemy.

At the last International Telegraph Conference a clause was adopted in Article XV of the Convention, agreed to by the representatives of about 20 powers, that the stipulations of the treaty "do not in any respect restrict the freedom of action of belligerents," whereby the cutting of cables during war is greatly encouraged.

Recent reductions in the tariff charge for telegraphic messages, and especially those for the press, have been much appreciated, and further reductions are expected in the near future. A scheme has been proposed on more than one occasion for the taking over by the governments of the world of the cables owned by submarine cable companies and placing their management under an international council representing the different nations. It is maintained that, if the cables become cosmopolitan property, the number of lines can be increased to any extent, and the charge for transmission so reduced as to make the foreign trade of the world an extended home trade, alike common to all nations.

ELECTRICIAN.

New York, June 4.

Some Late Apparatus of the Western Telephone Construction Company.

Ever on the alert for the latest and best that can be profitably employed in perfecting its various devices, and always ready to meet the demands of a critical telephone public, the Western Telephone Construction Company, of Chicago, has just brought out some new forms of special apparatus for which strong claims of efficiency, compactness and general superiority are made. A brief description of some of the more important types follows:

FIG. 1.—PORTABLE DESK SET, WITH COMBINED TRANSMITTER AND RECEIVER.

Fig. 1 shows a portable desk telephone employing a combined transmitter and receiver, which is claimed to be the most perfect instrument of the kind thus far produced. A platinum contact switch mounted in the handle or stem of the instrument, which is grasped in the hand, is of improved Watson design, and makes and breaks telephonic circuits in practically the same manner as does the approved telephone switch hook, ordinarily mounted in the Western company's magneto bell box and operated by the influence of the telephone receiver.

FIG. 2.—WESTERN NO. 7 ADJUSTABLE ARM TRANSMITTER.

The switch requires no appreciable effort to operate, and is positive and reliable in action. The relative distance of mouthpiece of transmitter from receiver is not permanently fixed, but can be easily adjusted or varied to suit the convenience of user, and be made to conform to cranial measurements.

The transmitter is of the solid-back, amplifying type, having large volume of voice transmission, perfect distinctness of articulation under all circumstances, and is adapted for use over long high-resistance lines, as well as short-circuits. The receiver is of the bi-polar type, and has compound magnets. Magneto generator and bells provided for use with this set are of high efficiency, and adapted to meet requirements of the most exacting service. The illustration shows the box, with generator, bells and induction coil mounted therein, which arrangement is generally preferred. However, extension bell and induction coil are furnished mounted in one box, and magneto generator in a separate small box, if desired. An extension shaft for the crank-handle is furnished where the generator is back under the desk. The set is furnished for either series or bridging lines. These combination sets are highly efficient, ornamental and of light weight, and are particularly desirable on account of the convenience afforded the user in the matter of allowing one to assume a perfectly comfortable position while carrying on a conversation.

In Fig. 2 is shown the company's new solid-back, adjustable-arm transmitter, another view giving the arrangement of induction coil, mounted in the base, and the connections.

The transmitter movement is of the solid-back type, mounted in fine cast, nickeled box, with hard-rubber back. It is said that it will not pack or deteriorate after long term of use.

The induction coil is of special winding, is mounted in base of adjustable arm in a thoroughly workmanlike manner. Screw and washer terminals are provided and soldered connections.

Four insulated binding posts are mounted in base of arm for attachment of primary and secondary circuits. The construction of the coil is such that, used in combination with the transmitter, the greatest volume and sensitiveness is secured with a minimum amount of battery power.

LITERARY.

The June *Scribner*, though made up on the eve of war, contains evidences of the impending calamity in several clear and serviceable war maps, which were inserted after the rest of the magazine had gone to press. Well known writers and artists will depict actual phases of the war in succeeding issues. Arrangements have been made to cover the operations by land and sea.

Appreciation of the Volunteer Engineers.

[*From the New York Evening Sun.*]

To judge from the list of those who have passed the examination for commissions in the First Regiment of the Brigade of Volunteer Engineers, that organization ought to be one of the most valuable which the present situation has called forth.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

ARLINGTON, S. D.—The Sioux Valley Electric and Telephone Company has been incorporated by W. J. Maxwell, C. C. Maxwell, M. M. Orlady and A. F. Maxwell; capital stock, $50,000.

ST. MARY'S, W. VA.—The McKim Telephone Company has been organized, with R. H. Browse, president; L. A. Ellis, secretary, and Arlando Eddy, treasurer.

CARROLLTON, OHIO—The Carroll County Telephone Company has been incorporated by Union C. De Ford, H. J. McGranahan, J. C. Patterson, A. L. Iden and Simeon Ashbrook; capital stock, $10,000.

ANDERSON, IND.—Postal Telegraph Company has been incorporated by Leander B. Parker, Ed J. Wally, W. I. Chapin, Frank W. Samuels, Ed Wallardt and John F. Looney; capital stock, $5,000.

CONNEAUTVILLE, PA.—Conneautville Telephone Company, of Crawford County, has been incorporated by R. F. Wilcox, L. D. Carey, J. H. Smith, I. T. Snodgrass, W. J. Darby, D. E. Hewit; capital stock, $4,500.

OTTAWA, N. S. — Anglo-French Telegraph Company has been incorporated to construct a line by means of a cable and land line from Vancouver to Dawson City, with extensions.

BIVALVE, MD.—John W. P. Insley is endeavoring to organize a company for the establishment of a telephone system extending from Salisbury to Nanticoke, a distance of 35 miles.

MENA, ARK —The Mena Telephone Company has been incorporated by H. M. Quigley, Edward Kerogh and J. S. Kelley; capital stock, $5,000.

SODUS, N. Y.—It is announced that an effort will be made to connect the village of Joy on the local telephone exchange. The plans are now under way.

GALVA, ILL. — The Galva Telephone Company has been incorporated by George D. Palmer, L. H. Johnson and W. A. Wigen to conduct a telephone business; capital stock, $2,000.

THIBODAUX, LA.—The Cumberland Telephone Company has obtained franchise to construct and operate a telephone system.

HAGERSTOWN, MD.—The Chesapeake & Ohio Telephone Company has established communication with Clearspring and other points in the western section of the county. The system extends to Cumberland and on West.

MEDINA, N. Y. — The Citizens' Telephone Company has been incorporated; capital, $12,000.

COVENTRY, N. Y.—A telephone line is being constructed to this place.

CONNERSVILLE, IND.—The Frazee telephone line now has connection to the West with Rushville, Glenwood, Griffins, Fayetteville, Fairview, Falmouth and many other points.

TIFFIN, OHIO—The Home Telephone Company, of this city, will soon commence work on toll lines extending from this place to Fort Seneca, Old Fort, Greenspring, Bettsville, Burgoon, New Riegel, Berwick, Adrian and McCutchenville. The company's line to Fostoria will be completed this week.

LOWVILLE, N. Y.—The Central New York Telephone Company has several men engaged in stringing wires for the telephone exchange in this village.

ALBION, MICH.—The Postal Telegraph agency at this place, which has been in charge of C. C. Reed, has changed hands. Its local business is now managed by Charles O'Conner.

FERGUS FALLS, MINN.—The Fergus Telephone Company has let the contract for the new system to Jones & Winter, of St. Paul. It is to be put in ready for talking July 31.

HALL'S HILL, TENN.—The telephone line being put in from Watertown to Murfreesboro by the Cumberland Telephone Company was completed to this place last Saturday evening.

BARABOO, WIS.—A company was formed here, with a capital stock of $100,000, for the purpose of constructing telephone lines all over the state. The incorporators are F. T. Brewster, F. A. Philbrick and W. H. Hatch.

DOWNSVILLE, IND.—The Maryland Telephone Company will extend its line to this place.

WAUSEON, OHIO—The Ohio Telephone Toll Line Company has been incorporated by Ed L. Barber, James S. Brailey, Jr., James C. King, H. A. Barber and F. A. Lynn, with $30,000 capital, to operate a telephone toll line between Toledo and Cleveland and having branches extending into adjacent counties.

CHATTANOOGA, TENN.—The Gainesboro Telephone Company is rapidly extending its line to connect with the Dixie Telephone Company and Postal Telegraph-Cable at McMinnville.

SUMMITVILLE, IND.—The Fairmount Telephone Company will extend its lines to this place, and has asked the County Commissioners for a franchise through the southern part of the county.

PIGGOTT, ARK.—B. L. Royal and Noah E. House have just completed a telephone line between this place and St. Francis. They will likely extend it to Boydsville, where it will connect with the Corning line.

ROMNEY, W. VA.—The telephone line between this place and Cumberland, Md., has been completed. The line between Romney and Capon Bridge is also finished.

New Electric Railways.

LONACONING, MD. — The Lonaconing & Westernport Passenger Electric Railway Company will build power plant to operate its railways.

IOLA, MO.—The Iola Rapid Transit Company has been incorporated; capital stock, $10,000. Directors: William S. Hendricks, George A. Bowlus, William J. Evans, J. Earl Chastain, Lewis L. Northrup, Alfred W. Beck and Eugene K. Taylor.

SPRINGFIELD, OHIO—The Dayton, Springfield & Urbana Transit Company, with a capital stock of $1,000,000, has been organized for the purpose of building and operating an electric line between Springfield and Dayton, the line to be ultimately extended north to Urbana.

MILLBURY, MASS. — Franchises have been granted for an electric road from Webster to Worcester through Auburn, a distance of 12 miles. The cost will be about $200,000, and it is said the road may be finished this season.

SOUTH BETHLEHEM, PA. — The Coplay, Egypt & Ironton Street Railway Company has been incorporated, with a capital stock of $60,000. The president and directors of the company are as follows: H. Y. Horn, president, and Jilten J. Coleman, W. B. Clark, Morris L. Kauffman and J. G. Meyle are to be the directors for the first year, or until others are chosen in their places.

AKRON, OHIO—Work on the Cleveland, Medina & Southern Electric Railway, which passes through this county, has been commenced.

ST. LOUIS, MO.—The St. Louis, Clayton & Creve Cœur Railway Company has contracted for the construction of a large power-house near the county fair grounds, to furnish power for the operation of cars over the extension of the Forest Park & Clayton Electric Railway.

CANANDAIGUA, N. Y.—The citizens of this place are considering a proposition by the Canandaigua Electric Light and Railway Company to extend the present trolley system to Manchester, seven miles from here, passing through two villages on the way, if the citizens will raise a $20,000 subscription.

Electric Light and Power.

LANCASTER, PA.—The Lancaster Electric Light, Heat and Power Company held a meeting of stockholders recently, and decided to increase the capital stock from $150,000 to $250,000, and also to issue bonds to the amount of $100,000, for the purpose of enlarging plant.

VICTORIA, TEX.—The Mayor may be addressed concerning proposed electric light plant, etc.

NEOSHO, MO.—The Neosho Electric Light Company will probably erect a new steam-power plant, abandoning its present water-power.

GALLATIN, TENN.—The Mayor may be addressed for information regarding electric light plant.

UVALDE, TEX.—The Uvalde Water, Ice and Electric Company will shortly commence work on proposed electric light plant. Plant is to have one arc and 350 incandescent lamps.

OTTUMWA, IOWA — It is reported that another electric light plant is to be established here.

FREMONT, OHIO — The Creager Electric Light and Power Company has been incorporated by Frank Creager, J. H. Clauss, John M. Sherman, Horace B. Buckland and Samuel Brinkerhoff, with $50,000 capital, to furnish light and power.

CLIO, MICH.—The new electric light plant which has been under construction for the past two months has been completed and is now in operation.

LAWRENCEBURG, KY.—George W. Dyer, of Princeton, Ky., has been awarded contract to supply the city with electric lighting.

RUTLAND CITY, VT.—The Rutland City Electric Company is removing to its new plant.

New Incorporations.

DECATUR, ILL.—Electric Supply and Fixture Company has been incorporated by C. E. Gibson, G. B. Marshall and R. H. Coleman, to manufacture electric supplies; capital stock, $2,500.

CLEVELAND, OHIO—The United States Carbon Company has been incorporated by Hallert D. Smith, Howard A. Couse, Herbert H. Henry, Braxten Davenport and H. F. McMills; capital stock, $100,000. They will make and sell carbons.

Notice to Advertisers.

There is great activity, particularly throughout the West, in electric power transmission, electric lighting, street railway construction, and the electrical industries in general. The ELECTRICAL REVIEW is read by every one assisting in this development. Manufacturers and dealers in apparatus and supplies can reach them through its advertising columns. Remember the Conventions of the National Electric Light Association and the Northwestern Electrical Association, which occur June 7-9, and June 10-14, respectively.

The Stromberg-Carlsen "Central Energy" System for Telephone Exchanges.

The busy little town of Lockport, Ill., situated some 33 miles from Chicago, on the now famous Drainage Canal, can boast of having the first

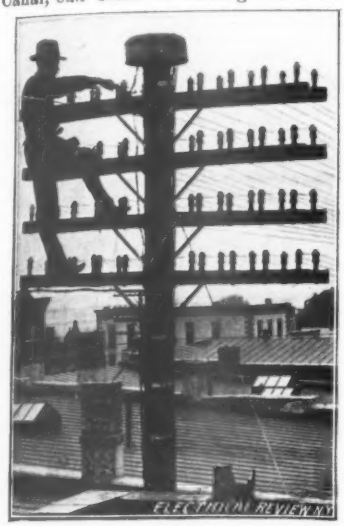


FIG. 1.—"STERLING" POLE TOP ON TERMINAL POLE, LOCKPORT, ILL.

independent telephone exchange using the "central energy" system, recently developed by the Stromberg-Carlsen Telephone Manufacturing Company, of Chicago. The exchange is at present equipped for 150 lines only, but the company has great faith in Lockport becoming a rival, from a manufacturing point, of its eastern namesake in New York, as soon as the water-power of the canal is available. Hence, in equipping the exchange, and in laying out the construction work, adequate provision was made to accommodate any possible growth of the plant.

In this system, which as stated, is new to the independent telephone field (and the name "independent" seems now to be applied to anything outside the Bell interests), no magneto generator or other signaling mechanism, except an ordinary push-button, is used at the subscriber's station or outside of the exchange. At the central office a power generator, driven by water, electricity or other suitable means, is provided, furnishing current to the subscriber's line, either when the operator calls by inserting plug in subscriber's jack, or when the subscriber, by pressing a button, completes the circuit through the line and ground. The operation of answering a call and the switching or connecting mechanism is the same as with the older system.

In thus concentrating the signaling energy at one central point, many advantages are obtained. Not only is the first cost of equipment considerably reduced, but the maintenance is cut down to a minimum and the liability to trouble lessened. The efficiency of the service is also increased, for, instead of grinding away repeatedly at a crank, the slight pressure of a finger, even from a child, results in almost instant communication with the subscriber desired.

FIG. 2.—INTERIOR VIEW OF STROMBERG-CARLSEN TELEPHONE EXCHANGE AT LOCKPORT, ILL.

The completed exchange, small as it is, may be cited as a good example of what modern telephone construction should be. Nothing cheap or inferior has been used, either in the way of apparatus or construction material. Substantial poles, varying from 35 to 50 feet in length, carry the wires above any interfering foliage. Where cabling is resorted to, Sterling pole top terminals are used, giving a finished appearance and being quite an improvement over the old-style, clumsy cable boxes.

The opening of the exchange, which took place on the 28th ult., was made the occasion of considerable festivities on the part of the company and its subscribers. The feature of the evening was a telephone concert, by which each subscriber enjoyed for several hours selections of vocal and instrumental music, varying from mandolin and guitar duets to the latest selections from "Pinafore."

The Maryland Telephone Manufacturing Company.

The Maryland Telephone Manufacturing Company, with the following officers: M. Meyerdirck, president; H. H. Hobelman, vice-president; H. Knollenberg, secretary, has been organized at Baltimore, Md., and has established a factory at Nos. 11 and 13 East Lee street, that city, under the general superintendence of Mr. C. B. Clark, formerly the electrician of the Home Telephone Company, of Mobile, Ala., an independent company operating a multiple switchboard, the type being that known as the "Minnis" system.

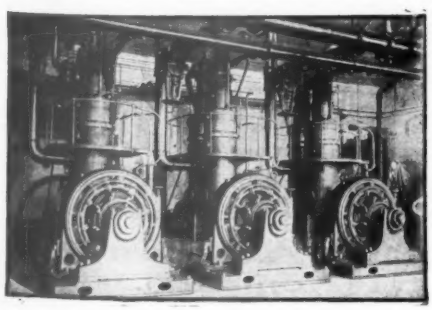
The sales office of this company, under the management of Mr. Paul Minnis, a well known electrical engineer and telephone inventor, has been

FIG. 1.—MARYLAND COMBINED RECEIVER AND TRANSMITTER.

located at No. 130 Fulton street, this city, where may be found a complete line of up-to-date samples of the various types of telephones manufactured by the Maryland company. This company is making features of the Brown loud-speaking transmitter and the Minnis system of telephones and switchboards, the latter being covered and protected by nearly a score of patents. The company is now in the market for all kinds of exchange orders as well as orders for interior and intercommunicating sets, exten-

FIG. 2.—MARYLAND DESK TELEPHONE SET.

sion bells, desk sets, etc. The illustrations on this page will interest users of telephone apparatus generally.



DIRECT-COUPLED UNITS FOR ARC LIGHTING

Engines Especially Designed for This Service.
Dynamos Especially Designed for These Engines.

CENTRAL VALVE ENGINES.

Compound or Triple Expansion. Condensing or Non-Condensing.

GIVE MAXIMUM ECONOMY.

Over 215,000 I. H.-P. in use and on order.
Lowest Cost Per K. W. Hour. Highest Efficiency. Combined Sets Occupy Smallest Possible Floor Space.

M. C. BULLOCK MFG. CO., 1179 W. Lake St., CHICAGO.

Kindred.... ...Interests

The Swett & Lewis Company, 11 Bromfield street, Boston, has accepted the selling agency for a well and favorably known faradic battery, the details of which can be obtained by sending for bulletin No. 23.

William Roche is now working on a battery cut-out to be used on gas-lighting and telephone circuits that promises, from experiments made so far, to be a revelation. The writer saw a test made with this "check valve" in circuit. The battery rang a bell with the cut-out in circuit, and tried after a minute or two to ring the same bell with said cut-out in circuit; it would not ring. Then tried the bell on the battery direct and it rung it as good as the first trial. Reversed the connections on cut out to battery with the same result as on the battery local.

The Bryant Electric Company, of Bridgeport, Ct., are erecting a new two-story power-house, 50 feet square. The building has brick side walls, and the framework is of steel, skeleton type. The floor of the building is supported on heavy girders and columns, which carry steel joists supporting corrugated iron arches and concrete floor. The roof has clear span trusses carrying corrugated iron covering, lined with patent anti-condensation roof lining, which prevents the condensation of moisture on the underside of the roof covering, and avoids any damage or inconvenience from moisture dropping on the delicate machinery or material on the floor below. This building was designed and the steel material furnished and erected by the Berlin Iron Bridge Company, of East Berlin, Ct.

The Westinghouse Induction Motors (type "C") are everywhere demonstrating their usefulness in new fields. Some two years since, the Westinghouse company installed for the Silver Spring Bleaching and Dyeing Company, of Providence, R. I., a complete plant for power purposes, and the growth of the business since that time has recently called for an equipment of 15 type "C" induction motors of the latest type. The conditions of service are very severe, indeed, many of the motors] operating continuously in clouds of steam or in the presence of chloride fumes, which rapidly corrode all exposed copper parts. No direct-current motor could stand the service for a day. Some of these motors have to exert four times the normal torque in starting ironing machines or calendars full of heavy gearing, etc. The installation, which was regarded as a risky experiment among such manufacturers when first contemplated, has proven a most pronounced success.

Among the recent orders received by the Walker Company may be mentioned the following:

One 250-kilowatt belted railway generator and four double 4 A S 1,000 railway equipments for the Holland, Mich., & Lake Michigan Railway Company; one 50-kilowatt direct-connected lighting generator for Russell & Company, Pittsburgh, Pa., to be shipped to Sewickly, Pa.; one 250-kilowatt belted generator for Norton & Taunton, Mass., Street Railway Company; one 30-kilowatt direct-connected generator, ordered by S. M. Fischer, Chicago, for the Patton Motor Company, same place; one 30-kilowatt generator for W. A. Johnson Electric Company, Toronto; one 200-kilowatt direct-connected

(Continued on page 381.)

McINTIRE'S PATENT
CONNECTORS AND TERMINALS.
Special Connectors for HARD-DRAWN COPPER WIRE, *All Sizes.*
Fused Wire, Fused Links and Strips.
The C. McINTIRE CO., 13 & 15 Franklin Street, Newark, N. J.

THE AWL-ROENTGEN-LIGHT TUBES.
COOLED TARGETS ✧ OXYGEN VACUUMS.
POWER ✧ DIFINITION ✧ LONG LIFE.
KIRMAYER AND OELLING, BOSTON.

The Best Service
rendered to mankind is
Telephone Service.
The Message Rate System of Charges places New York Telephone Service within the reach of all.
The Equipment of Stations in the New York System is uniform, the cost of the service varying only with the amount of use.
MINIMUM RATE, 600 LOCAL MESSAGES,
... $90 a year ...
NEW YORK TELEPHONE COMPANY
18 Cortlandt, 15 Dey, 252 Broadway, 115 W. 38th

AN electrical and mechanical establishment wishes for direct connections with manufacturers of machinery for electrical plants. Please address,
S. C., 638,
Care Aug. J. Wolff & Co.'s Advertising Office,
COPENHAGEN, K.

A BARGAIN.
We have for sale a 25-horse-power horizontal engine (Nagle, Erie, Pa.) and boiler for same; only used a short time; good as new. Will be sold low.
Address A. H. Potts & Co.,
Parkesburg, Pa.

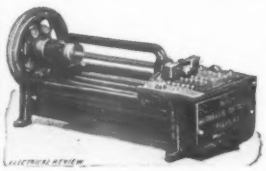
THIS CO HAS BEEN MAKING
TELEPHONES
20 YEARS, NOT CHEAP BUT SERVICEABLE AND FULLY GUARANTEED.
CIRCULARS FURNISHED.
VIADUCT ELECTRIC Co.
BALTIMORE, MD., U. S. A.

DIRECT-READING AMMETERS
OR
VOLTMETERS,
Like cut, reading from 0 to 10, at $1.50 each. 0-25 at $5.00 each.
Cherry Electric Works,
25 & 27 3d Avenue, NEW YORK.

Quick-Break Switches.
If you desire the best, latest and most improved quick-break switch on the market, get the
"DEMARY."
They are all made of the best material that can be obtained, and all parts are standard in size.
These switches are made in one grade only, highly polished and lacquered.
Send for Catalogue and Prices.
They will interest you.
R. C. DEMARY,
133 Erie County Bank Building, BUFFALO, N. Y.
MARYLAND AGENTS:
Cookman Electrical Mfg. Co., BALTIMORE, MD.

IRON ROOF FOR SALE.
Width of building 155 ft., out to out, divided into a center span 66 ft., with a wing on each side 43 ft., 6 in.; total length of the building, 350 ft. This building is designed with brick sides and gable walls, with iron roof trusses and iron supporting columns; originally built for an iron foundry, but owing to the failure of the purchaser is now offered for sale at a bargain. Is admirably adapted for a foundry for light or heavy castings, machine shop, car barn, or for any other general manufacturing purposes. We guarantee the iron work as good as new, building never having been used.
Apply to
THE BERLIN IRON BRIDGE COMPANY,
EAST BERLIN, CONN.

Full of Life and Even Temper!
SMALL
SPRINGS
OF EVERY DESCRIPTION MADE BY
THE WALLACE BARNES CO.
BRISTOL, CONN., U. S. A.
ESTABLISHED 1857.
FLAT OR ROUND WIRE, STEEL OR BRASS. A complete assortment of high-grade COLD ROLLED STEEL kept in stock, .003 to .049 inch thickness.
Springs enameled or plated. Tempering done at short notice. Ribbon steel made to order.
Send samples and write for quotations.



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Engineers and Contractors
Desiring a thoroughly reliable Automatic Starting Apparatus for electric pumps, elevators and other intermittent work, can not do better than send for our catalogue of Motor-Driven Starters and Specialties. No dash-pots, shunt magnets or other delicate mechanism, yet automatic start and instantaneous release under all conditions.
Automatic Switch Co., Baltimore, Md.
For New York City and New Jersey, D. H. Durrin, Vanderbilt Bldg., N. Y.
For Mich., Wis., Ill., Ind., and Iowa, Harding & Hammer, Marquette Bldg., Chicago.
For Louisiana, Vincent Gray, New Orleans.

HOUSE GOODS - A SPECIALTY-
PARTRICK, CARTER & WILKINS · MANUFACTURERS AND DEALERS ·
125 So. 2nd. St. PHILA.
GENERAL ELECTRICAL SUPPLIES

Bargains in Dynamos, Engines, Etc.
Direct-current dynamos of 350, 700, 725, 800, 810, 900, 1,075, 1,350, 1,610 and 2,500 light capacity.
Alternating-current dynamos of 750, 900, 1,300 and 2,000 light capacity.
Arc dynamos, 20, 24, 30, 40, 50 and 60 lights, both 1,200 and 2,000 candle-power.
Engines, 50, 75, 85, 100, 115, 125, 150, 175 and 200 horse-power.
Boilers, 100, 250, 375 and 500 horse-power.
Heaters, 150 and 2,000 horse-power.
Pumps, all sizes.
Write us for Price-list No. 21.
This apparatus has been removed from our own Central Stations to make room for larger units. We therefore know its history and can guarantee it to be in thoroughly good operative condition.
CHICAGO EDISON COMPANY, 139 Adams St., CHICAGO.

KINDRED INTERESTS.

(Concluded from page 380.)

generator for Lewiston Electric Light Company, Lewiston, Ida.; two 225-kilowatt belted railway generators for the Wheeling & Elm Grove Electric Railway Company, Wheeling, W. Va.; United States Ordnance Department, six 10-inch disappearing gun carriages for coast fortifications. The following orders for foreign shipment have been received: Edgar C. Moxham & Company, New York city, for Manaos Railway Company, Brazil, three 130-kilowatt direct-current railway generators. Through agents in Japan, Messrs. Bagnall & Hilles, Yokohama, one 75-kilowatt railway generator and switchboard apparatus, and two double railway motor equipments of 3 S 800 motors. Through London agency, 15 double equipments of 33 S 800 motors and type S L controllers, two 120-kilowatt railway generators with switchboard apparatus and five double railway motor equipments of 3 N 800 motors.

It is reported that extensive additions to the Westinghouse Electric and Manufacturing Company's plant at East Pittsburgh are to be made immediately.

The Cling-Surface Manufacturing Company, 10 Court street, Buffalo, N. Y., are the manufacturers of a belt dressing for which unusual merit is claimed. In one instance, this firm reports, a gain of 24 per cent was secured by using "Cling-Surface."

Stromberg-Carlsen Telephone Manufacturing Company, Chicago, is sending out a handsomely printed folder, serving as an advance sheet to a more elaborate and extended catalogue of new types of apparatus soon to be issued. The rapid progress and more and more exacting demands of the independent telephone interests make newer and more efficient apparatus a necessity, and the company named is among the foremost in anticipating the demands of its patrons.

The Williams Electric Company, Cleveland, is rapidly completing its equipment of special tools, dies, etc., for the manufacture of a superior grade of telephone apparatus. The company was recently organized, and at once secured adequate quarters in the Kennard Block, putting in a complete line of modern machinery for the purpose mentioned. Mr. J. A. Williams, the president and general manager of the company, has been long and favorably known as an engineer of high standing, and may justly be regarded as a pioneer in the manufacture of independent apparatus. Mr. F. J. Keller, vice-president, and Mr. B. S. Chamberlin, the secretary and treasurer, are among Cleveland's best business men, who, realizing the possibilities of the business, became identified with the new concern. Among the several specialties the company will make may be mentioned the Williams improved generator and a new type of receiver, each embodying features not heretofore applied to any apparatus of that kind.

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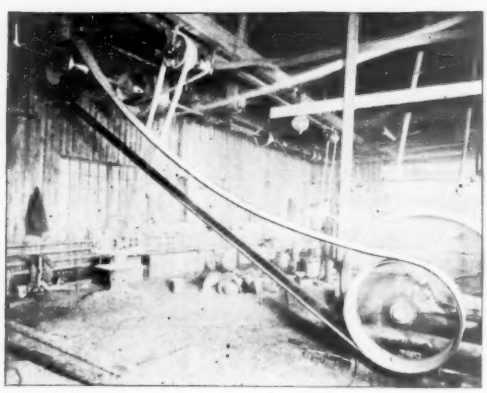

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED MAY 24, 1898.

604,684 Automatic vibratory interrupter; D. McF. Moore—Consists of an operating magnet for an automatic vibratory interrupter, in the circuit including the interrupter contacts, and a jarring device for insuring continuous action of the interrupter.

604,685 Electric lighting apparatus; D. McF. Moore, New York, N. Y.

604,686 Apparatus for producing luminous or similar effects; D. McF. Moore.

604,687 Circuit-interrupting mechanism; D. McF. Moore—The combination with a vacuous receptacle, of a circuit interrupter therein, a motor for driving the interrupter, the rotary part of which motor is within said receptacle and has its coils insulated and thoroughly embedded in a vitreous mass.

604,688 Circuit interrupter; D. McF. Moore, New York, N. Y.

ISSUED MAY 31, 1898.

604,712 Electrical signaling system and apparatus; W. F. Banks, Milford, Ct.

604,729 Elevated electric car line; J. H. Cooley, Paris, Tex.

604,747 Electric railway; John H. Guest, Boston, Mass.—Consists of a trough-shaped contact rail forming a working conductor, the supplemental contact rails or conductors within the same, the metal cross pins or bars mounted in the sides of the trough and passing through said rails but insulated from them, and a filling of insulated cement or concrete in which the rails and pins are anchored.

604,806 Electrical belt; A. J. Taylor, Vineland, N. J.—An electro-galvanic belt consisting of a sheath, hook plates attached thereto, a battery detachably connected to said hook plates within the sheath, and battery electrodes arranged outside of the sheath and having a hinged connection with the sheath and electrical connection with the hook plates in the battery.

604,866 Signal for electric railways; W. H. Jordan, Brooklyn, N. Y.—Consists of main or working conductors, of an electro-magnetic signal controller connected between one of the main or working conductors and two distant contact plates located in close proximity to the same conductor, and which contact plates are adapted to be electrically and successively connected with the other main or working conductor through the contact devices and circuit connections of a moving vehicle.

604,874 Safety device for electric carriages; R. T. D. Brougham, London, England—Consists of a closed box, a keyhole leading into the box, two open contacts within the box, remote from the keyhole and connected to the circuit wires, and a key so shaped that it passes through the keyhole, and when the key is turned connects the contracts.

TREASURY DEPARTMENT, UNITED STATES Life Saving Service, Washington, D. C., June 4, 1898.—Sealed proposals will be received at this office until two o'clock P. M. of Tuesday, June 14, 1898, for furnishing the Life Saving Service 454 miles of No. 10 B. & S. hard-drawn copper wire and 11,400 oak brackets. Specifications and full information can be had upon application to the Inspector of Life Saving Stations, 24 State street, New York city, or to this office. Horace L. Piper, Acting General Superintendent.

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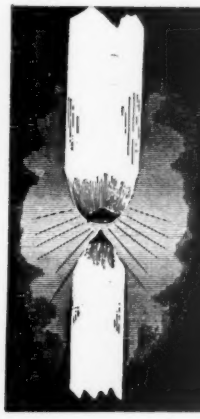

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